ENVIRONMENTAL ASSESSMENT

MAMMAL DAMAGE MANAGEMENT IN THE STATE OF NEW JERSEY

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

PREPARED IN COOPERATION WITH:

UNITED STATES DEPARTMENT OF INTERIOR
UNITED STATES FISH AND WILDLIFE SERVICE
MIGRATORY BIRD PERMIT OFFICE, REGION 5

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CY	Calendar Year
CSA	Cooperative Service Agreement
CWA	Clean Water Act
C&E	NJDEP, Compliance and Enforcement
DEA	Drug Enforcement Agency
DCP	Beaver Damage Control Permit
EA	Environmental Assessment
EIS	Environmental Impact Statement
ENSP	Endangered and Nongame Species Program
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FID	Firearms Purchaser Identification Card
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FY	Fiscal Year
HPS	Hantavirus Pulmonary Syndrome
IWDM	Integrated Wildlife Damage Management
MDM	Mammal Damage Management
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NJAC	New Jersey Administrative Code
NJAES	New Jersey Agricultural Experiment Station
NJDA	New Jersey Department of Agriculture
NJDEP	New Jersey Department of Environmental Protection
NJDFW	New Jersey Division of Fish and Wildlife
NJDOH	New Jersey Department of Health
NJSA	New Jersey Statutes Annotated
NJTPA	North Jersey Transportation Planning Authority
NWRC	National Wildlife Research Center
PPE	Personal Protective Equipment
RSU	Rutgers, The State University
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
TNR	Trap, Neuter, Release/Return Program
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WS	Wildlife Services
WSS	NJDFW Wildlife Services Section

CHAPTER 1: NEED FOR ACTION AND SCOPE OF ANALYSIS

1.1 INTRODUCTION

Across the United States, 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 animals which increases the potential for conflicting human/animal interactions. This Environmental Assessment (EA) evaluates the potential environmental effects of alternatives for Wildlife Services' involvement in mammal damage management in New Jersey. The United States 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. Code Annotated (USC) 8351- 8352) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 8353)). Human/animal conflict issues are complicated by the wide range of public responses to animals and animal damage. What may be unacceptable damage to one person may be a normal cost of living with nature to someone else. The relationship in American culture of values and damage can be summarized in this way:

> *Animals have either positive or negative values, depending on varying human perspectives and circumstances (Decker and Goff 1987). Animals are generally regarded as providing economic, recreational and aesthetic benefits, and the mere knowledge that animals exist is a positive benefit to many people. However, the activities of some animals may result in economic losses to agriculture and damage to property. Sensitivity to varying perspectives and values is required to manage the balance between human and animal needs. In addressing conflicts, managers must consider not only the needs of those directly affected by damage but a range of environmental, sociocultural and economic considerations as well.*

WS' activities are conducted to prevent or reduce animal damage to agricultural, industrial, and natural resources, and to 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 approach (WS Directive 2.105)[1] in which a combination of methods may be used or recommended to reduce damage. 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 damage caused by animals from private and public entities, including tribes and other governmental agencies. As requested, WS cooperates with land and animal management agencies to reduce damage effectively and efficiently in accordance with applicable federal, state, and local laws and Memorandums 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 direct, indirect, and cumulative impacts. In addition, this EA has been prepared to evaluate a range of alternatives to meet the need for action while addressing the issues associated with mammal damage management. Pursuant to the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations, WS is preparing this EA to document the analyses associated with proposed federal actions and to inform decision-makers and the public of reasonable alternatives

[1] WS Program Directives are available at https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/SA_WS_Program_Directives

capable of avoiding or minimizing significant effects. This EA will also serve as a decision-aiding mechanism to ensure that the policies and goals of the NEPA are infused into the actions of the agency[2].

The WS program continues to receive requests for assistance or anticipates receiving requests for assistance to resolve or prevent damage or threats associated with black bear (*Ursus americanus*), American beaver (*Castor canadensis*), feral/free-ranging cat (*Felis domesticus*), eastern chipmunk (*Tamias striatus*), coyote (*Canis latrans*), wild and captive white-tailed deer (*Odocoileus virginianus*), feral/free-ranging dog (*Canis familiaris*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), nutria (*Myocastor coypus*), Virginia opossum (*Didelphis virginiana*), river otter (*Lontra canadensis*), porcupine (*Erethizon dorsatum*), eastern cottontail (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), eastern gray squirrel (*Sciurus carolinensus*), red squirrel (*Tamiasciurus hudsonicus*), feral swine (*Sus scrofa*), woodchuck (*Marmota monax*), and small mammals, such as insectivores (shrews and moles - orders *Insectivora* and *Soricomorpha*) and rodents (mice, rats, and voles - order *Rodentia*).

1.2 NEED FOR ACTION

Some species of wildlife have adapted to thrive in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between people and wildlife that lead to requests for assistance to reduce damage to resources and to reduce threats to the safety of people. Both sociological and biological carrying capacities must be applied to resolve wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations (Hardin 1986). Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). These phenomena are especially important because they define the sensitivity of a person or community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. This damage threshold determines the wildlife acceptance capacity. While the habitat may have a biological carrying capacity to support higher populations of wildlife, in many cases the wildlife acceptance capacity is lower or has been met (Hardin 1986). Once the wildlife acceptance capacity is met or exceeded, people begin to implement population or damage management to alleviate damage or address threats to human health and safety.

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (Leopold 1933; Berryman 1991; The Wildlife Society 2010). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for damage management is derived from the specific threats to resources. The need for action to manage damage and threats associated with mammals arises from requests for assistance[3] received by WS to reduce and prevent damage associated with mammals from occurring to four major categories: agricultural resources, natural resources, property, and threats to human safety. WS has identified those mammal species most likely to be responsible for causing damage to those four categories based on previous requests for assistance.

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

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

Table 1.1 lists WS' technical assistance projects involving mammal damage or threats of damage to those four major resource types from the federal fiscal year[4] (FY) 2012 through FY 2016. Technical assistance is provided by WS to those persons requesting assistance with resolving damage or the threat of damage by providing information and recommendations on mammal damage management activities that can be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities will be discussed further in Chapter 2 of this EA. Table 1.1 does not include direct operational assistance projects where WS was requested to provide assistance through the direct application of methods.

The technical assistance projects conducted by WS are representative of the damage and threats that are caused by mammals. However, these numbers likely underestimate the amount of mammal damage in New Jersey. WS has a MOU with New Jersey Division of Fish and Wildlife (NJDFW) and other entities which states that the NJDFW is primarily responsible for technical assistance involving state-regulated wildlife species such as mammals and wild turkey; meanwhile, WS is primarily responsible for damage-related issues with migratory birds, federally-protected species and hazards at airports. In June 2018, WS and NJDFW entered into a Cooperative Service Agreement (CSA) having WS address technical assistance calls for mammals as well as provide direct control for certain mammal damage issues.

Table 1.1 - WS' technical assistance projects conducted in New Jersey, FY 2012 - FY 2016

Species	Projects	Species	Projects
Bats (all)	3	**Norway rat**	2
Beaver	23	**Raccoon**	16
Black bear	3	**Red fox**	17
Coyote	18	**River otter**	1
Deer mouse	3	**Shrews (all)**	1
Domestic animals (pet/livestock)	2	**Striped skunk**	11
Eastern chipmunk	2	**Unidentifiable mammals**	1
Eastern cottontail rabbit	2	**Virginia opossum**	3
Eastern gray squirrel	8	**Voles (all)**	2
Feral cats	3	**White-tailed deer (captive)**	5
Feral swine	40	**White-tailed deer (wild)**	72
House mouse	1	**Woodchuck**	16
Moles (all)	1		
		TOTAL	**256**

The NJDFW technical assistance calls for mammalian species are listed in Table 1.2. Unlike the WS technical assistance Table 1.1 which covers five years of data based on fiscal year, the NJDFW Table 1.2 covers only three years of data and is based on calendar year (CY). A total of twenty-five mammalian species were attributed to WS's technical assistance projects. White-tailed deer accounted for the highest number of calls for both WS (28.1%) and the NJDFW (24.1%). Feral swine (15.6%), beavers (9%), coyotes (7%), and red foxes (6.6%) rounded out the WS top-five species with the most requests for technical assistance. The NJDFW top-five species also included foxes, coyotes and beavers; however, raccoons replaced feral swine for the NJDFW top-five species. The NJDFW also received calls about mammalian species which WS did not; these species include bobcats, mountain lions (not present in New Jersey), and muskrats. During the CY 2014-2016 for the species reported by both agencies, the NJDFW received 54.3 times as many mammalian-related technical assistance calls than WS - 4,668 and 86 calls respectively.

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

Table 1.2 - NJDFW technical assistance calls conducted in New Jersey, CY 2014 - CY 2016

Species *	Calls	Species *	Calls
Bats (all)	84	**Raccoon**	483
Beaver	564	**River otter**	12
Bobcat	36	**Squirrels (all)**	135
Coyote	801	**Striped skunk**	204
Foxes (all)	888	**Virginia opossum**	60
Mountain lion	42	**White-tailed deer (wild)**	1,146
Muskrat	15	**Woodchuck**	210
Rabbits (all)	81		
		TOTAL	**4,761**

* In addition, black bear and feral swine calls are received by NJDFW but not included in table.

Table 1.3 lists mammal species addressed in this EA and the resource types that these species can cause damage to in New Jersey. Many of the mammal species addressed in this EA can cause damage to or pose threats to more than one resource. Most requests for assistance received by WS are associated with those mammal species causing damage or threats of damage to property and human safety. For example, many of those mammal species listed in Table 1.3 are potential vectors for zoonotic diseases or can damage property through digging, burrowing or damaging lawns, houses and businesses. Specific information regarding mammal damage to agricultural resources, natural resources, property, and reduce or prevent threats to human health and safety are discussed in the following subsections.

Table 1.3 - Mammal species WS received requests for assistance from FY 2012 – 2016 and the resource type affected by those species

Species	Resource *				Species	Resource *			
	A	H	N	P		A	H	N	P
Bats (all)		X		X	**Norway rat**		X		X
Beaver		X		X	**Raccoon**		X	X	X
Black bear		X			**Red fox**		X	X	X
Coyote	X	X	X	X	**River otter**		X		
Deer mouse		X		X	**Shrews (all)**		X		
Domestic animals (pet/livestock)	X			X	**Striped skunk**		X		X
Eastern chipmunk				X	**Unidentifiable mammals**		X		
Eastern cottontail rabbit	X			X	**Virginia opossum**	X	X		
Eastern gray squirrel		X		X	**Voles (all)**	X			X
Feral cats		X		X	**White-tailed deer (captive)**			X	X
Feral swine	X	X	X	X	**White-tailed deer (wild)**	X	X	X	X
House mouse				X	**Woodchuck**	X	X		X
Moles (all)				X					

* A=Agriculture, H=Human Health and Safety, N =Natural Resources, P=Property

Need for Mammal Damage Management to Protect Property

Damage to property accounts for the largest percent of WS technical assistance projects (49%) and involves the greatest number of mammalian species (20). Examples of property WS assisted with in FY

2012 – FY 2016 include, but is not limited to, buildings, recreational areas, vehicles, aircrafts, utility structures, trees, pets and turf/gardens.

Earthen structures such as dams, dikes, levees, railway embankments and stream banks are vulnerable to damage created by mammals, specifically beavers, muskrats and woodchucks. However, other species can also have a negative effect on these structures. For instance, predatory wildlife may enlarge the burrows and tunnels in search of prey further weakening the structure; in addition, herbivores may consume vegetation growing on the structures, leading to erosion (FEMA 2005). FEMA (2005) notes another effect of wildlife on earthen structures is hydraulic alteration, which has the most significant impact but is the least obvious. Beavers are believed to cause the broadest range of negative effects such as restricting natural waterflow, creating sudden high-volume water discharges if beaver dam fails, and clogging water control structures (FEMA 2005). Muskrats and woodchucks dig extensive burrows and tunnel systems which cannot be seen but have a substantial impact on both the structural integrity (localized collapse of the structure) and the hydrology (seepage paths and volumes) (FEMA 2005). Bayoumi and Meguid (2011) describe a 1993 earthen dam failure, due to neglected wildlife burrowing activities, at Iowa Beef Processors Waste Pond which cost an estimated $5 million for railway repair, environmental cleanup, and five derailed locomotives. In another example, they describe 150 flooded homes in Winfield, Missouri after the Pin Oak levee failed, resulting in around $1 billion damage. The initial breech in this case is believed to be a result of recent muskrat digging as well as past plugged muskrat holes (Bayoumi and Meguid 2011). As indicated, various resources can be effected by beaver, muskrat and woodchuck activity such as residential buildings, roadways, railways, airports, recreational areas, farmland, and natural areas.

High deer densities can result in property damage to vegetation at both residential and non-residential buildings as well as at nursery operations and in natural areas. Sayre et al. (1992) conducted a survey in southeastern New York which showed 66.7% of nursery operations experienced deer damage during the 1988 growing season. Their survey also revealed 32% of homeowners reported deer damage on their property and 73% of landscapers reported deer damage to customer plants. When figures from southeastern New York were compared to that of western New York, southeastern New York experienced more severe damage likely due to higher deer densities and fragmented habitat in suburban areas (Sayre et al. 1992). The NJDEP Division of Science's (2016b) Environmental Trends Report for white-tailed deer noted that New Jersey's deer density would be 14 deer per square mile if the 2013 population was equally distributed throughout the state. However, they emphasized that urban areas generally have a low density of deer while suburban and rural areas with good habitat have more. For example, before deer management efforts Princeton, New Jersey had 114 deer per square mile (NJDEP Division of Science 2016b). "*Although New Jersey has some of the most liberal deer hunting regulations in the nation, lack of or restricted hunter access results in undesirable deer densities in many areas of the state*" (NJDEP Division of Science 2016b).

Wildlife strikes with aircrafts and vehicles possess a threat to human health and safety as well as property and can be costly. Between 1 January 1990 through 30 April 2016, there were 216 reported strikes with civilian aircrafts involving mammals in New Jersey, resulting in a reported total of $1,650,980 in damage (FAA national wildlife strike database 2016). Nationwide between 1990 and 2015, civilian aircrafts have collided with a reported 65 identified mammalian species, including 43 terrestrial species and 22 bat species (Dolbeer et al. 2016). New Jersey has 475 licensed aviation facilities and heliports, comprising of 43 public use (including 2 international airports), 75 private use and 314 heliports (NJDOT 2013). Furthermore between 1986 and 2000, New Jersey indicated a $38 million economic impact from deer-vehicle collisions, which is the third highest in the northeastern United States (Drake et al. 2005). Huijser et al. (2008) reports that 90% of vehicle collisions with deer result in damage to the vehicle equaling an average of $1,840 in repairs. The driver may also sustain additional costs and hardships such as towing, medical care, and/or lost wages (Huijser et al. 2008).

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 pathogens to humans, mammal hazards at airports, and risks and actual instances of mammals injuring humans. Human health and safety concerns and problems are the second highest resource category which WS receives technical assistance requests for (30%). In addition, this resource category accounts for the second highest number of different mammalian damage agents (18), ranging from technical assistance with deer and raccoons to rodents and bats.

Threat of disease transmission

Zoonotic diseases are diseases which are transmissible between animals and people. Disease transmission can occur from direct interactions between people and animals or from interactions with pets and livestock that have direct contact with wild mammals. Pets and livestock often encounter and interact with wild mammals, which can increase the possibility of transmission to people. With the exception of arthropod-borne (e.g., ticks) pathogens, pathogen transmission from wild and free ranging mammals to humans is uncommon. However, the infrequency of such transmissions does not diminish the concerns of those individuals requesting assistance because pathogen transmission has been documented and is possible. Diseases which can be transmitted from wild or free ranging mammals to humans may be bacterial, spirochetal, rickettsial, viral, fungal, prions or parasites.

This section includes brief descriptions of some zoonotic diseases for which WS could provide surveillance or management assistance. Additional examples of zoonotic diseases, their animal host and how humans become exposed are displayed in Table 1.4. Hosts are organisms that harbor or carry other organisms either externally or internally (e.g., parasites). This discussion is intended to briefly address the more commonly known zoonotic diseases associated with those species addressed in this EA. It is not intended to be an exhaustive discussion of all potential zoonoses. Subsequently, this list is not all-inclusive and new diseases may be identified in the future or may be introduced from other geographic areas.

WS continues to receive requests for assistance from persons concerned about the potential risk of transmission of pathogens to humans from wild and free ranging mammals. Many of these requests involve animals living near humans, animals acting out of character, or animals showing no fear of humans. Under the proposed action, WS could provide both technical assistance and direct operational assistance to these persons. WS could also conduct or assist with the monitoring or surveillance of pathogens in wild and free ranging mammals addressed in this EA. Most disease sampling occurs ancillary to other wildlife damage management activities (*i.e.*, disease sampling occurs after wildlife have been captured or lethally removed for other purposes). For example, WS may collect blood samples to test for tularemia from fox, coyote, beaver and muskrat that were lethally removed to alleviate damage occurring to property. WS may also sample mammals captured or lethally taken by private or other government entities or dying from other causes (e.g., collisions with vehicles), such as sampling feral swine taken by private individuals for zoonotic or other diseases.

Table 1.4 - Animal diseases that pose potential human health and safety risks through transmission to humans (Davidson 2006; Miller et al. 2013; Conover and Vail 2015).

Disease (causative agent)	How humans contract	Hosts[1]
Anthrax (*Bacillus antracis*)	Direct contact, ingestion, inhalation	Mammals
Brucellosis, bovine (*Brucella abortus*)	Direct contact, ingestion, inhalation	Feral swine, coyotes, others
Brucellosis, swine (*Brucella suis*)	Direct contact, ingestion, inhalation	Feral swine, rodents, others
Dermatophilosis (*Dermatophilus congolensis*)	Direct contact	Mammals
Echinococcosis/ hydatidosis (*Echinococcus multilocularis*)	Ingestion	Canids[2], felids[3], cervids[4], rodents, rabbits
Ehrlichiosis (*Ehrlichia* species)	Bite of infected tick, possible direct contact or inhalation	Mammals
Giardiasis (*Giardia* species)	Ingestion	Beavers, coyotes, dogs, cats, muskrats, rodents
Hantavirus (Hantaviruses)	Consumption, direct contact, inhalation	Rodents
Histoplasmosis (*Histoplasma capsulatum*)	Inhalation	Bats
Leptospirosis (*Leptospira interrogans*)	Direct contact, ingestion, inhalation	Rodents, raccoons, skunks, opossums, nutria
Lyme (*Borelia burgdorferi*)	Bite of an infected tick	Mammals
Mange, demodetic (*Demodex odocoilei*)	Bite of infected mite	White tailed deer
Mange, scarcoptic (*Scarcoptes scabiei*)	Bite of infected mite	Coyotes, foxes
Plague (*Yersinia pestis*)	Bite of infected flea, inhalation	Chipmunks, carnivores, cats, rabbits, squirrels, others
Rabies (*Rhabdovirus*)	Direct contact, inhalation	Mammals
Raccoon roundworm (*Baylisascaris procyonis*)	Ingestion	Raccoons
Rocky Mountain Spotted Fever (*Rickettsia rickettsii*)	Bite of infected tick	Mammals
Salmonellosis (*Salmonella* species)	Ingestion	Cats, dogs, Feral swine, others
Toxoplasmosis (*Toxoplasma gondii*)	Ingestion	Bobcats, cats
Trichinellosis, Trichinosis (*Trichinella spiralis*)	Consumption	Carnivores, feral swine, raccoons, rodents, bears, others
Tularemia (*Francisella tularensis*)	Bites of infected fleas and ticks, consumption, direct contact, inhalation	Beavers, rabbits, muskrats, rodents, others
Typhus, Epidemic (*Rickettsia prowazekii*), Murie typus (*Rickettsia typhi*)	Bite of infected lice or fleas, direct contact, inhalation	Rodents, others
Spirometra (*spirometra mansonoides*)	Ingestion	Bobcats, cats, dogs, foxes, raccoons, others

[1] Host species listed here only include those animals addressed in this EA. The use of the general term "*mammals*" as the host species denotes zoonotic diseases that could infect a broad range of mammals.
[2] Canids include dogs, coyotes, and foxes
[3] Felids include cats, bobcats
[4] Cervids include deer and elk

Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal. Rabies is preventable, but it is fatal without prior vaccination or post-exposure treatment. Both bat and raccoon rabies variants are present in New Jersey, and high-risk wild animals include raccoons, skunks, foxes, groundhogs and bats (NJDOH 2017a). The NJDOH (2017a) briefly describes fatalities

resulting from rabies in the United States: Between 2003 and 2015, 37 human rabies deaths in the United States and Puerto Rico were reported to the Center for Disease Control and Prevention (CDC). The number of human deaths attributed to rabies in the United States (U.S.) has declined significantly from hundreds per year to an average of three fatal cases per year. New Jersey's last fatal indigenous case of human rabies was in 1997 when a man had direct contact with bats but did not seek treatment. Prior to this, the last fatal occurrence was in 1971 when a person did not received a complete rabies post-exposure prophylaxis (PEP) treatment. In 2011, New Jersey also had a fatal, non-indigenous case of human rabies which was contracted in Haiti from a dog. The NJDOH (2016a) estimates that each year 2,500 people within New Jersey receive rabies PEP treatment after exposure to a known or suspected rabid animal. Meanwhile, an estimated 40,000 – 50,000 people nationwide receive the rabies PEP treatment annually according to the CDC (CDC 2015).

In 2016, the NJDOH (2016b) reported testing 2,822 specimens for rabies of which 262 tested positive. Terrestrial wildlife species accounted for 67.9% of 2016's positive specimens with raccoons accounting for 137 positive specimens, followed by skunks with 25. Bats accounted for 22.5% while domestic animals (pets and livestock) accounted for remaining 9.5% of positive specimens. Cats accounted for 24 of the 25 positive domestic animal specimens; in fact, cats annually have accounted for 90% of the cases involving domestic animals since 1989. NJDOH (2017a) summarizes the CDC's report on the United States and Puerto Rico's 2014 cases - which have similar percentages to New Jersey noted above. Of the 6,033 positive rabies specimens in 2014, terrestrial mammals accounted for 63.5%, bats 29.1%, and domestic animals (pets and livestock) 7.4%. Another similarity is that cats account for more than half of the nation's domestic animal positive specimens.

Feral swine are potential reservoirs for a plethora of viral and bacterial pathogens and parasites. Diseases that have been identified in feral swine that can also infect humans include brucellosis, leptospirosis, salmonellosis, toxoplasmosis, trichinosis, trichostrongylosis, sarcoptic mange (Seward et al. 2004), tuberculosis, tularemia (Hubalek et al. 2002; Stevens 2010), anthrax, rabies (Luangtongkum et al. 1986) and plague (Beach 1993). Infection may occur from direct exposure to swine by handling live animals or carcasses (Giurgiutiu et al. 2009) or through ingestion of undercooked pork, contaminated water or food crops (Jay et al. 2007). It can also occur when feral swine infect another host (e.g., domestic or wild animal) which then infects a person (West et al. 2009). Although incidence of disease transmission from feral swine to humans is relatively uncommon, infections with diseases such as brucellosis, tuberculosis, and tularemia can be fatal.

Hantavirus Pulmonary Syndrome (HPS) is caused by infection from certain species of hantaviruses. Infection in humans causes acute, severe respiratory disease. Rodents are the primary reservoir hosts of hantaviruses and are asymptomatic carriers, with the white-footed mouse and the deer mouse being the primary reservoir hosts. Human infection occurs when virus particles aerosolized from rodent urine, feces, or saliva are inhaled or by handling rodents (Davidson and Nettles 1997). CDC (2017a) has reported cases in 36 states as of January 2017, but no cases of HPS in New Jersey. However, the CDC has reported HPS in neighboring states, including Pennsylvania (9 cases) and New York (3 cases). Nationally, 36% of human HPS infections result in death (CDC 2017b).

Tularemia, also known as "rabbit fever," is a disease caused by the bacterium *Francisella tularensis*. 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. From 2005 to 2015, an average of 158 human cases of tularemia were reported each year in the U.S.; while, New Jersey reported 13 cases during this timeframe with an average of one case per year (CDC 2016d). Without treatment with appropriate antibiotics, tularemia can be fatal (CDC 2016c). 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).

Tick-borne diseases found in New Jersey include, but are not limited to, Anaplasmosis, Babesiosis, Ehrlichiosis, Lyme disease and Rocky Mountain spotted fever which are transmitted to humans by black-legged "deer" ticks, American dog ticks, and/or lone star ticks (NJDOH 2017c). According to the CDC (2016a) in 2015, New Jersey reported 4,855 cases of Lyme Disease which was the second highest in the nation. Between 2005 and 2015, New Jersey ranked in the top four annually along with neighboring states of Pennsylvania and New York (CDC 2016a). Nelson et al. (2015) reviewed 2005 – 2010's medical claims concluding that 106.6 clinician-diagnosed Lyme disease cases per 100,000 persons occurred annually; whereas, the CDC surveillance data reported 9.4 cases per 100,000 persons annually for the same timeframe. On the other hand, both the medical claims data and CDC surveillance data show that the same 15 states and district account for the highest rate of incidences (Nelson et al. 2015). Meanwhile, Egizi et al. (2017) assessed the human risk of ehrlichial infections relative to Lyme disease in Monmouth County, New Jersey. Their study concluded that at a minimum for every two cases of Lyme disease, one case of ehrlichiosis would occur. However, they discovered Monmouth County only reported on average 361 cases of Lyme disease per year and 5.5 cases of *Ehrlichia chaffeensis* infection per year. They believe that ehrlichiosis is grossly underreported/misreported or that many people show no symptoms.

Feral cats can carry numerous zoonotic diseases including rabies, cat scratch disease (Bartonella henselae), Salmonella (Salmonella spp.), murie typhus (Rickettseia typhi), plague (Yersinia pestis), tularemia (Francisella tularensis), toxoplasmosis (Toxoplasma gondii), hookworm (Uncinaria sterocephala, Ancylostoma tubaeforme, Ancylostoma braziliense, Ancylostoma ceylanicum), and raccoon roundworm (Gerhold 2011; Gerhold and Jessup 2012). Many zoonosis carried by cats are not life-threatening to humans if they are diagnosed and treated early. However, certain portions of the population are at higher risk including children under the age of five, adults over 65 and persons with weakened immune systems (e.g., cancer patients undergoing chemotherapy) (CDC 2016e). For example, in 1994, five children in Florida were hospitalized with encephalitis associated with cat scratch fever (Patronek 1998). In 2002, fleas from a feral cat colony which had grown from 100 to 1,000 cats, despite a trap, neuter and release effort, caused a daycare center at the University of Hawaii in Manoa to close for two weeks because of concerns about the potential transmission of murie typhus and flea (ctenocephalides felis) infestations afflicting 84 children and faculty (Jessup 2004). In another example, in 2010, cats using Miami-Dade County beaches as a litter box were responsible for at least seven confirmed and eight unconfirmed human hookworm infections (Gerhold and Jessup 2012). A similar incident occurred in Miami in 2006 when 22 people were diagnosed with hookworm at a children's camp where feral cats were observed (Gerhold and Jessup 2012).

Feral dogs can also carry zoonotic pathogens. These include leptospirosis, salmonellosis, spirometra, and rabies and they serve as hosts for parasites that carry additional zoonotic diseases. For example, the primary way which people in Arizona are infected with Rocky Mountain spotted fever is feral dogs. From 2002 to 2004, an outbreak resulted in the hospitalization of 15 people and the death of two people (Demma et al. 2005).

Raccoon roundworm is a roundworm commonly found in the small intestine of raccoons which causes severe or fatal encephalitis in a variety of mammals, including humans (CDC 2016b). It also causes eye and organ damage in humans. Humans become infected by ingesting soil or other materials (e.g., bark or wood chips) contaminated with raccoon feces and roundworm eggs. Young children are at particular risk for infection as a result of behaviors such as placing potentially contaminated fingers and objects like toys into their mouths (CDC 2016b). Raccoons are the primary host for the roundworm, but other animals can

become infected. Cases are rare with fewer than 25 cases occurring in the U.S. (CDC 2016b). Although rare, infection can be serious. As of 2012, there were 16 reported human neurological cases of raccoon roundworm in the U.S.; six of these people died (CDC 2016b).

Threat of aircrafts and vehicles striking animals

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 hunting and trapping seasons and are insulated from many other human disturbances. Preventing damage and reducing threats to human safety is the goal of those cooperators requesting assistance at airports given that a potential strike can lead to the loss of human life and considerable damage to property.

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

Between 1990 and 2015 in the United States, 3,572 civilian aircraft strikes were reported involving terrestrial mammals and an additional 1,581 involved bats (Dolbeer et al. 2016). The number of mammal strikes actually occurring is likely to be much greater, since an estimated 80% of civil wildlife strikes go unreported (Cleary et al. 2000) and terrestrial mammal species with body masses less than one kilogram (2.2 pounds) are excluded from the database (Dolbeer 2005; Dolbeer et al. 2016). During the 26 year reporting period of injury-causing civilian strikes in the U.S., white-tailed deer were involved in 20 strikes that caused 27 injuries and one death, dogs were involved in one strike that injured two people, and eastern cottontails were involved in one strike that injured one person (Dolbeer et al. 2016).

In New Jersey, there were 216 reported strikes with civilian aircrafts involving mammals from 1 January 1990 through 30 April 2016 (FAA national wildlife strike database 2016). Twelve terrestrial mammal species accounted for 78% of the reported strikes or 169 reports, while eight bat species represented the remaining 22% or 47 reports (Table 1.5). White-tailed deer accounted for over a quarter of the reported strikes with 56 incidents, followed by woodchuck (24), striped skunk (22), Eastern cottontail rabbit (21), and Virginia opossum (19). These five species represent 84% of the reported terrestrial mammal strikes in New Jersey.

Table 1.5 - Mammal species reported as struck by civilian aircraft in New Jersey from 1/1/1990 – 4/30/2016

Species	# Reports	Species	# Reports
Bats (all)	15	Raccoon	5
Big brown bat	2	Red bat	11
Coyote	4	Red fox	3
Feral cat	2	Silver-haired bat	1
Eastern cottontail rabbit	21	Striped skunk	22
Eastern pipistrelle	1	Unknown terrestrial mammal	2
Foxes (all)	3	Vesper bat	1
Hoary bat	8	Virginia opossum	19
Little brown bat	8	White-tailed deer	56
Muskrat	8	Woodchuck	24
		TOTAL	**216**

In addition, some species addressed in this EA pose minimal strike hazards at airports but their presence on airport property can attract other species which pose higher risks of aircraft strikes. For instance, a high density of insectivores, rodents and cottontails on airport property are a food source and therefore an attractant for many predator species. For example, raptors often pose a high risk to aircraft due to their relative size and their soaring and hovering behavior. Therefore, reducing rabbit densities at airports can reduce risks of strikes with raptors by reducing the availability of a food source.

Wildlife populations near or found confined within perimeter fences at airports can be a threat to human safety and cause damage to property when struck by aircraft. Those wildlife confined inside the airport perimeter fence would not be considered distinct populations nor separate from those populations found outside the perimeter fence. Wildlife found within the boundaries of perimeter fences originate from populations outside the fence. Those populations inside the fence do not exhibit nor have unique characteristics from those outside the fence and do not warrant consideration as a unique population under this analysis.

Wildlife does not only have the potential to collide with aircrafts but also with vehicles. As of 2015, New Jersey has over 39,000 miles of roadways open to the public (NJDOT 2016) and has the highest human density in the nation (NJDEP Division of Science 2016a). The potential for wildlife-vehicle collisions exists. In fact, NJTPA (n.d.) reports 7,599 crashes involving animals in New Jersey during 2015, resulting in 371 human injuries and 3 fatalities. These statewide figures do not differentiate between species involved in the crashes; however, other research has shown that 9 out of 10 animal-vehicle accidents involve deer as well as only 50% of these crashes are reported to authorities (NJTPA n.d.). While the national crash database reports only 300,000 wildlife-vehicle collisions per year, Huijser et al. (2008) estimates that between 1-2 million wildlife-vehicle collisions occur annually in the United States based on information from the national crash database, insurance industry, police crash reports and carcass count data.

Additional human safety concerns

Humans are increasingly living in close proximity to wildlife. This closeness has led to a decline in the fear wildlife have toward people. Mammal attacks on humans, although rare, occur for numerous reasons. White and Gehrt (2009) analyzed 142 incidents of coyote attacks in the U.S. and Canada between 1960 and 2006. Of these attacks, they found 37% were considered predatory, 22% investigative, 7% rabid, 6% pet-related, 4% defensive and 24% unknown. The study noted that the number of rabid cases may be underestimated due to unsuccessful trapping efforts of the offending coyote. In addition, the study found intentional or accidental feeding of coyotes in the vicinity of the attack site for 30% of the incidents. In New Jersey, NJDFW (2017c) reported seven incidents between 1999 and 2016 of coyotes attacking adults or children as well as eight incidents between 2003 and 2013 of coyotes attacking dogs, some of which resulted in the dog's death. More recently, New Jersey news media has reported on coyotes attacking a man in January 2017 (Zaremba 2017) and dogs in June 2017 (Milo 2017). Other mammals addressed in this EA can also threaten human health and safety through attacks, such as feral swine. Although attacks on people associated with those species addressed in this EA occur rarely, requests for assistance to reduce the threat of possible attacks could occur. Reasons for assistance could occur from a desire to reduce the threat of disease transmission, from a fear of aggressive behavior from an animal that does not show a fear of people, or from a fear of aggressive behavior from an animal that is exhibiting aggressive behavior caused by disease (e.g., rabies).

Need for Mammal Damage Management to Protect Agricultural Resources

Agriculture resources in New Jersey include, but are not limited to, fruits and vegetables, field crops, livestock, nurseries, and vineyards. The agri-food industry is the third largest industry in New Jersey (New Jersey Agriculture... 2014). In fact, New Jersey ranked as a top producer nationally for cranberries (3rd), peaches (4th), bell peppers (4th) and blueberries (5th) in 2015 (Eklund 2016). Also, New Jersey producers ranked 4th for cut flower sales and 5th for potted flowering plants sales in the nation for 2014 (Eklund 2015). During the same year, New Jersey ranked tenth in the nation for total horticulture sales, making it the only northeastern state placing in the top ten (NASS 2016). WS's technical assistance requests between FY 2012 and FY 2016 involved twelve different agricultural resources effected by mammals.

New Jersey agriculture generated sales totaling $1.043 billion in 2015 (NJDA n.d) from 9,100 farms consisting of approximately 720,000 acres (Eklund 2016). The New Jersey Agricultural Statistics 2016 report, prepared by Eklund (2016), states the following acreage and production value for each sector of the State's agriculture community. Field crops, which consists of corn, hay, soybeans, sweet potatoes and winter wheat, accounted for the sector with the highest acreage (407,200). New Jersey's field crops had a production value of over $137 million in 2015. The State's 18 principle vegetables grown for fresh market resulted in $219 million from 32,700 harvested acres; while, apples, blueberries, cranberries and peaches yielded $147 million from 18,600 acres. In addition, New Jersey housed 12,000 pigs and 28,000 cattle in 2015 for meat and milk production (Eklund 2016). New Jersey's agriculture also includes vineyards and various horticulture productions. As of 2012, New Jersey ranked tenth in the nation for wine production (1.6 million gallons) and had 50 licensed wineries in the state (NJDA 2017). Six hundred thirty horticulture specialty businesses, with sales over $10,000, operated in New Jersey during 2014, including 90 Christmas tree farms, 25 sod producers, and 443 greenhouse operators (NASS 2016). Horticulture accounted for a $455 million industry in New Jersey (New Jersey Agriculture... 2014). "*In fact, New Jersey is the most productive farmland in the United States based on highest dollar value per acre*" (New Jersey Agriculture... 2014).

Drake and Grande (2002) conducted a study during the 2000 growing season to evaluate wildlife depredation to crops in New Jersey. They documented the following: 1) A loss of $1,767,404.77 from ten wildlife species on the 1,410 acres which was surveyed. 2) An economic loss to vegetable growers was the highest with $2,443.00 loss per acre; while, fruit growers experienced $379.94 loss per acre and grain farmers had $116.86 loss per acre. 3) White-tailed deer caused 72% of the wildlife damage documented in the study, resulting in an economic loss totaling just under $1.4 million. 4) Groundhogs, raccoons, rabbits, meadow voles, black bears and house mice were also found to have caused economic loss on the surveyed farms. Brittingham et al. (1997) who conducted a study in Pennsylvania also found that white-tailed deer were the primary cause of wildlife damage to field crops, with the exception of soybeans where woodchucks were the primary cause. Meanwhile, a study in Indiana attributed the primary wildlife damage agent of corn to raccoons (87%) and of soybeans to white-tailed deer (61%) and woodchucks (38%) (MacGowan et al. 2006). As far as mammal damage to orchards, a survey in Pennsylvania found that deer caused the majority of orchard damage in mountainous regions; while, voles were responsible for most damage occurring in flat, heavily agricultural areas (Anthony and Fisher 1977).

Nurseries, sod producers, Christmas tree farms and vineyards are also an important part of New Jersey agricultural economy. During 2001, single-family homeowners in New Jersey spent approximately $1 billion on turf maintenance and an additional $1.2 billion on ornamental plantings and maintenance (Govindasamy et al. 2007). All of these horticulture producers (nurseries, sod producers, Christmas tree farms and vineyards) are susceptible to damage caused by mammals. Lemieux et al. (2000) conducted a survey of nursery growers in the northeast United States and found that 65% of respondents experienced deer damage primarily from browsing but also due to rubbing and trampling. They found that narrowleaf

evergreens were most commonly damaged resulting in a median loss of $3,700 per respondent during the 1996 growing season. In addition, the respondents reported spending a median cost of $1,000 each that season on deer repellents (Lemieux et al. 2000). The number of growers experiencing deer damage in that study is similar to results from Sayre et al. (1992)'s survey conducted nearly a decade earlier. A study at California vineyards using motion-activated video cameras for wild turkey also showed raccoon and fox consuming grapes, causing strip damage (Coates et al. 2010). Goldammer (2015) notes that deer create damage at vineyards when plant shoots are starting to emerge and food sources are scarce, which can set back a new vineyard for an entire season. He adds that deer also can create severe yield losses at the time grapes are harvested.

New Jersey's livestock industry is not as large as its crop or horticulture production nor as large as neighboring states; therefore, a small loss at a livestock producer could be devastating economically. Houben (2004) analyzed the National Agricultural Statistics Service's (NASS) predator loss surveys for sheep, goat and cattle in the southern and eastern United States. He found that predation was the leading cause of mortality in sheep and lambs, resulting in a $610,444 loss for the region during 1999. In addition, he noted over $10 million loss of cattle due to predation during 2000. Coyotes, which more heavily prey on lambs and calves than adults, accounted for 60.7% of the sheep loss and 70.1% of the cattle loss due to predation (Houben 2004). The average annual predation on domestic sheep where no management was implemented resulted in a 5.7% loss of adult sheep and 17.5% loss of lambs based on the 1999 NASS report; however, where an Integrated Wildlife Damage Management (IWDM) plan of nonlethal and lethal techniques was used the rates significantly decreased to 1.6% loss of adult sheep and 6% loss of lambs (Bodenchuk et al. 2000). Bodenchuk et al. (2000) found that in 1998 for every $1 spent on livestock protection, $3.06 market value of livestock was saved. Predation is a direct effect of wildlife on livestock; though, several indirect effects also exist. Howery and DeLiberto (2004) noted predators can force livestock away from high-quality habitat into lower-quality habitat and/or smaller foraging areas. They conclude this could have a negative impact on the livestock's weight and condition as well as its productivity which has a direct correlation to forage intake.

Rutgers Equine Science Center (2007)'s report noted New Jersey's 7,200 equine operations housed 42,500 equine animals in 2006 with a value of $582 million. Furthermore, New Jersey's equine industry accounts for 176,000 acres as well as an additional 46,000 acres of hay and grain produces for the horses, equaling approximately one-fifth of the state's agricultural acreage. The report concludes 71% of the operations housed fewer than eight equine animals and 61% consisted of less than 10 acres of land, making it largely an industry of small farms. The total economic impact of the State's equine industry is $1.1 million annually (Rutgers Equine Science Center 2007). Coyote attacks on horses are rare and uncommon but have been reported in Michigan (Acosta 2015) and New York (Rusack 2016). Diseases transmitted by wildlife might be more of a concern for New Jersey's equine industry. Equine protozoal myeloencephalitis (EPM), which effects the central nervous system, is caused either by a parasite whose known hosts are opossums or by another parasite whose assumed hosts are domestic or wild carnivores (Zoonoses: What horse owners need to know 2014). Rabies, leptospirosis, and salmonella are also among the diseases that can be transmitted from wild mammals to humans and horses (Zoonoses: What horse owners need to know 2014).

Although the source of disease outbreaks can be difficult to identify, a risk of disease transmission exists wherever wild or free ranging mammals and livestock interact or use the same resources such as water or feed (Berentsen et al. 2014). Of the animal diseases that occur in the U.S., 72% (42) are presumed to require wildlife to transmit, maintain or complete the life cycle of the pathogen (Miller et al. 2013). Of these, six are so common in wildlife and their ability to infect domestic animals so common that it impedes their eradication (Miller et al. 2013). The role wildlife plays in livestock diseases is expected to increase (Siembieda et al. 2011). Diseases which can be transmitted from wild or free ranging mammals to livestock may be bacterial, spirochetal, rickettsial, viral, fungal, prions or parasites. Examples of

diseases, the livestock they affect and the animal host are displayed in Table 1.6. Livestock diseases cause loss through morbidity, mortality, decreased production, decreased feed efficiency, lower reproductive success, and the costs associated with veterinary diagnostics and treatment.

Table 1.6 - Wildlife diseases with mammalian hosts that pose threats to livestock in the United States (modified from (Miller et al. 2013)).

Disease	Affected livestock	Hosts*
Anthrax	Cattle, sheep, goats, horses, swine	All mammals
Aujeszky's disease	Swine, cattle, sheep, goats, horses	Feral swine, other mammals
Blue tongue	Sheep, goats, cattle	Cervids[1], others
Bovine anaplasmosis	Cattle	Cervids[1]
Bovine genital campylobacteriosis	Cattle	Numerous
Bovine viral diarrhea	Cattle, bison, camelids[2]	White-tailed deer, others
Brucellosis (*Brucella abortus*)	Cattle, sheep, horses	Feral swine, others
Brucellosis (*Brucella suis*)	Swine, horses	Feral swine, rodents, others
Chronic wasting disease	Domestic cervids[1]	Wild cervids[1]
Echinococcosis/ hydatidosis	Sheep, cattle	Canids[3], felids[4], cervids[1], rodents, rabbits
Epizootic hemorrahagic disease	Cattle, sheep	White-tailed deer, others
Equine encephalomyelitis (eastern and western)	Equids[5], repots of cattle, sheep, camelids[2] and pigs	Rodents, white-tailed deer, others
Infectious bovine rhinotracheitis/infectious pustularvulvovaginitis	Cattle	Several implicated
Leptospirosis	Cattle, sheep, goats, pigs, horses, others	Rodents, raccoon, skunk, opossum, nutria
Maedi-visna	Sheep, goats	Ruminants[6]
Malignant catarrhal fever	Cattle, bison, swine, sheep, goats	Cervids[1], wild ovine species
Myxomatosis	Rabbits	Rabbits
Paratuberculosis	Cattle, sheep, goats	Ruminants[6], rabbits, others
Plague	Numerous	Chipmunks, carnivores, others
Q fever	Cattle, sheep, goats	Numerous
Rabbit hemorrhagic disease	Rabbits	Rabbits
Transmissible gastroenteritis	Swine	Feral swine
Trichinellosis (trichinosis)	Swine	Carnivores, feral swine, rodents, bears, others
Tularemia	Sheep, horses, pigs	Rabbits, muskrats, rodents, others
Vesicular stomatitis	Cattle, swine, equids[5], camelids[2], sheep, goats	Numerous

* Host species listed here only include those animals addressed in this EA.
[1] Cervids include deer and elk
[2] Camelids include llamas and alpacas
[3] Canids include dogs, coyotes, and foxes
[4] Felids include cats, bobcats
[5] Equids include horses, donkeys, and mules
[6] Ruminants include cattle, sheep, goats and deer

Need for Mammal Damage Management to Protect Natural Resources

Natural resources may be described as those assets belonging to the public and often managed and held in trust by government agencies as representatives of the people. Such resources may be plants or animals,

including threatened and endangered species (T&E) or habitats in general. Examples of natural resources in New Jersey include: parks, forest preserves, wildlife management areas, 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. New Jersey has 1,484,900 acres of preserved land consisting of 86% public open space and 14% preserved farmland (NJDEP Division of Science 2016a).

Piping plover were listed as a State endangered species in 1984 and the Atlantic Coast population was listed as federally threatened in 1986 (NJDFW n.d.). The NJDFW (n.d.) describes the piping plover as one of New Jersey's most endangered species with beach recreation and predation being serious threats to its recovery. "*Without intense protection and management, it is unlikely that the piping plover would survive in New Jersey*" (NJDFW n.d.). In 2015, predation accounted for 40.3% of the piping plover nest failures in New Jersey, of which mammals were the leading known predator (Pover and Davis 2015). Predation on nests by foxes, raccoons, skunks and rats increased near human development due to these species' attraction to food scraps; feral and unleashed dogs and cats are also a threat to piping plovers through disturbance and predation (USWFS n.d.). A study in Long Island, New York found that the main contributors to reduced hatching success was due to direct (predation) and indirect (nest abandonment) effects of predators and not poor egg viability (Doherty and Heath 2011).

Feral swine cause widespread damage to natural resources (USDA (2016): They consume large amounts of vegetation; destroy plants with their rooting, soil compaction, and wallowing behaviors; and in some areas, may eat or uproot protected, sensitive, unique, or rare plants. Often, the damaged land then becomes vulnerable to erosion and non-native, invasive plants. Wildlife is also impacted by feral swine. Since their diets overlap, feral swine and native wildlife end up competing for important and limited natural food sources, such as acorns and other forest tree nuts. Feral swine can destroy nests and eat the eggs of ground-nesting birds, such as quail, turkey, and shorebirds.

Deer overabundance has a direct and indirect effect on the forest ecosystem. Two studies in north central Pennsylvania evaluated vegetative characteristics between a 60 year-old maintained deer exclosure and an adjacent unfenced site. Goetsch et al (2011) found that overbrowsing by deer in the unfenced site locally eradicated many understory shrubs and herbs and caused other shrubs and herbs not only to be in low abundance but also to be smaller and less likely to flower. Decades of overbrowsing created an understory dominated by a single fern species (Goetsch et al. 2011). Kain et al (2011) found significant reduction in tree species richness and diversity in the unfenced site due to chronic deer browsing. Striped maple and American beech, which are both shade-tolerant and highly browse-resistant species, dominated 82% of the unfenced site but only 32% of the exclosure area (Kain et al. 2011). Overbrowsing can also indirectly affect the soil composition, insect availability, and bird diversity. Nuttle et al. (2011) studied canopy foliage density, canopy insect density and bird density in a 30 year study site with high deer densities during stand initiation, following a clear cut. They found that deer had shifted the ecosystem to tree species with less foliage for caterpillars, hence affecting insectivorous birds. McShea and Rappole (2000) studied forest bird populations over 9 years at four deer exclosure sites and four unfenced sites in northern Virginia. At the deer exclosure sites, they found once the understory vegetation returned so did the bird species that are of high priority for conservation efforts.

Feral cats can have an impact on wildlife as seen in scientific literature. Hawkins et al. (2004) determined the presence of feral cats that received supplemental food had a negative impact on native birds and rodents. Their study was carried out in California, comparing an area where cats were being fed by humans (cat area) to an area without any feeding (no-cat area). They found native rodents were more abundant in the no-cat area; meanwhile, the exotic, house mouse was more abundant in the cat area. The abundance of birds not associated with open-water also differed between the no-cat area and cat area, with the no-cat area having nearly twice as many birds (Hawkins et al. 2004). Loss et al. (2013)

conducted a systematic review of studies on predation rates of owned and un-owned cats. They concluded free-ranging domestic cats annually kill in the contiguous U.S. 1.4 - 3.7 billion birds (median = 2.4 billion) in addition to 6.9 - 20.7 billion mammals (median = 12.3 billion). Un-owned (feral) cats accounted for 69% of the avian mortality and 89% of the mammalian mortality (Loss et al. 2013). When compared with other human causes, annual mortality of birds (median = 2.4 billion) by cats is four times that of the second highest category of buildings and windows, which has a median of 599 million (Loss et al. 2015).

Need for Non-Damage Related Activities by WS Involving Mammals

Not all WS' activities related to mammals may involve traditional damage management or threats to human health or human safety. WS may be requested to assist with or conduct research and monitoring activities such as live-capturing mammals for marking or telemetry research or collecting road killed specimens to determine species distribution. WS' personnel may be involved in species population enhancement activities, such as live capturing mammals for reintroduction to historical habitat or habitat improvement. WS may also be requested to conduct or assist in rescuing and translocating mammals in dangerous situations or to euthanize severely injured or sick mammals that do not involve damage or threats to human health and safety.

1.3 NATIONAL ENVIRONMENTAL POLICY ACT AND WS DECISION-MAKING

All federal actions are subject to the NEPA (Public Law 9-190, 42 USC 4321 et seq.). WS follows CEQ regulations implementing the NEPA (40 Code of Federal Regulations (CFR) 1500 et seq.). In addition, WS follows the USDA (7 CFR 1b), and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. Those laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated in part by the CEQ through regulations in 40 CFR 1500-1508. In accordance with the CEQ and USDA regulations, APHIS guidelines concerning the implementation of the NEPA, as published in the Federal Register (44 CFR 50381-50384) provide guidance to WS regarding the NEPA process.

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

1.4 DECISIONS TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Management of most mammals in New Jersey is the responsibility of the NJDFW. WS' activities to reduce and/or prevent mammal damage as described in this EA would be coordinated with the NJDFW which would ensure WS' actions are incorporated into population objectives established for mammal species. Dogs and cats are classified as

domestic companion animals in the New Jersey and are managed by local law enforcement and animal control authorities.

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

- How can WS best respond to the need to address damage caused by mammals?
- Do the alternatives have significant impacts meriting an Environmental Impact Statement (EIS)?

1.5 AFFECTED ENVIRONMENT

Mammals can be found across New Jersey throughout the year. Therefore, damage or threats of damage associated with mammals could occur wherever mammals occur as would requests for assistance to manage damage or threats of damage. Assistance would only be provided by WS when requested by a landowner or manager and WS would only provide direct operational assistance on properties where a MOU, CSA, or other comparable document had been signed between WS and the cooperating entity.

Upon receiving a request for assistance, the proposed action alternative, or those actions described in the other alternatives could be conducted on private, federal, state, tribal, county, and municipal lands in New Jersey to reduce damage and threats associated with mammals. The analyses in this EA are intended to apply to actions taken under the selected alternative that could occur in any locale and at any time within the analysis area. This EA analyzes the potential impacts of mammal damage management (MDM) and addresses activities that are currently being conducted under a MOU, CSA, or other comparable document with WS. This EA also addresses the potential impacts of MDM in New Jersey where additional agreements may be signed in the future.

Federal, State, County, City, and Private Lands

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

Native American Lands and Tribes

At present there are no federally-recognized tribes in New Jersey. In the event that any Native American tribes become federally-recognized in the state, the WS program would only conduct damage management activities when requested by a Native American Tribe and only after a MOU or CSA has been signed between WS and the Tribe requesting assistance. Because Tribal officials would be responsible for requesting assistance from WS and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would be anticipated. Those methods available to alleviate damage associated with mammals on federal, state, county, municipal, and private properties under the alternatives analyzed in this EA would also be available for use to alleviate damage on Tribal properties when the use of those methods have been approved for use by the Tribe requesting WS' assistance. If any Native American tribes become federally-recognized in New Jersey,

the activities and methods addressed under the alternatives would include those activities that could be employed on Native American lands, when requested and agreed upon.

Site Specificity

This EA analyzes the potential impacts of MDM based on previous activities conducted on private and public lands where WS and the appropriate entities have entered into a MOU, CSA, or other comparable document. The EA also addresses the impacts of MDM on areas where additional MOUs, CSAs or other comparable documents may be signed in the future. Because the need for action is to reduce damage and because the goals and directives of WS are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional MDM efforts could occur. Thus, this EA anticipates the potential expansion and analyzes the impacts of such efforts as part of the alternatives.

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

Chapter 2 of this EA identifies and discusses issues relating to the management of damage and threats associated with mammals in New Jersey. 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 2 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives 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 New Jersey. 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.

1.6 AUTHORITY OF FEDERAL AND STATE AGENCIES

The authorities of WS and other agencies as those authorities relate to conducting wildlife damage management activities are discussed by agency below:

WS' Legislative Authority

The primary statutory authority for the WS program is the Act of March 2, 1931 (46 Stat. 1468; 7 USC 8351- 8352) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 8353)). 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 in managing wildlife damage.

United States Environmental Protection Agency (EPA)

The EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which regulates the registration and use of pesticides, including repellents and pesticides available for use to manage damage associated with mammals. The EPA is also responsible for administering and enforcing Section 404 of the Clean Water Act (CWA) along with the U.S. Army Corps of Engineers.

United States Fish and Wildlife Service (USFWS)

The USFWS is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife resources and their habitat. The USFWS has specific responsibilities for the protection of migratory birds, T&E species, inter-jurisdictional fish, and certain marine mammals, as well as for lands and waters managed by the agency in the National Wildlife Refuge System. The USFWS has statutory authority for enforcing the Fish and Wildlife Improvement Act of 1978 (16 USC 7.12), the Fish and Wildlife Act of 1956 (16 USC 742 a-j), and the Migratory Bird Treaty Act (16 USC 703-711).

United States Food and Drug Administration (FDA)

The FDA is responsible for protecting the public health by assuring the safety, efficacy, and security of human and veterinary drugs, biological products, medical devices, our nation's food supply, cosmetics, and products that emit radiation. The FDA is also responsible for advancing the public health by helping to speed innovations that make medicines and foods more effective, safer, and more affordable; and helping the public get the accurate, science-based information they need to use medicines and foods to improve their health.

United States Drug Enforcement Administration (DEA)

The DEA is responsible for enforcing the Controlled Substance Act (1970). The DEA prevents the abuse and illegal use of controlled substances by regulating their production, distribution and storage.

United States Army Corps of Engineers (USACE)

The USACE is responsible for regulating all waters of the U.S. under the CWA.

New Jersey Department of Agriculture (NJDA)

The NJDA currently has an MOU with WS, which establishes a cooperative relationship between WS and the NJDA and outlines roles and responsibilities for resolving wildlife damage management situations. The mission of the NJDA is to develop, promote, conserve, and support the agriculture and agribusiness industry of the state and those natural and renewable resources that are associated with agriculture and other open lands for the benefit of all its citizens. NJDA provides agricultural information and statistics to WS, forwards citizen's requests for wildlife damage management assistance to WS, and communicates wildlife damage management information to NJ's agricultural community. The NJDA chairs and coordinates meetings of the Animal Emergency Working Group and Wildlife Working Group, which consist of representatives from agencies involved in aspects of emergency planning and response to disasters involving animals and wildlife damage management in NJ, respectively.

New Jersey Department of Environmental Protection, Division of Fish and Wildlife (NJDFW)

The mission of the NJDFW is to protect and manage the State's fish and wildlife to maximize their long-term biological, recreational, and economic values for New Jersey residents. The NJDFW currently has an MOU with WS, which establishes a cooperative relationship between WS and the NJDFW and outlines roles and responsibilities for resolving wildlife damage management situations. The NJDFW Wildlife Services Section (WSS) has primary authority to handle wildlife damage management problems and programs involving resident game and furbearer species in NJ, as well as resident game birds such as wild turkey. WSS receives 2,000-3,000 complaints annually from farmers and homeowners. WSS assists the public with wildlife damage issues, nuisance wildlife problems (including but not limited to hazing, trapping, lethal removal, and habitat manipulation) and responds to emergency situations such as bear conflicts in suburban areas.

New Jersey Department of Environmental Protection, Compliance & Enforcement (NJDEP, C&E)

The NJDEP C&E mission is to ensure that New Jersey's environment is clean, safe, enjoyable, and maintained for future generations. Within the C&E, the Bureau of Licensing and Registration certifies and licenses pesticide users, registers pesticide products, and conducts other pesticide-related functions. Also within the C&E, the Bureau of Pesticide Compliance enforces State code and FIFRA requirements regarding the use, sale, transport, disposal, manufacture, and storage of pesticides in the State of New Jersey. Pesticide products and repellents for mammal damage control are registered through the C&E by USDA APHIS WS and other entities (i.e. pesticide manufacturers). Pesticide products and repellents available for use in mammal damage management in NJ are discussed in APPENDIX D. Prior to conducting management programs involving registered products or pesticides, current registration status is determined through consultation with the C&E.

New Jersey Department of Health (NJDOH)

The NJDOH currently has an MOU with WS, which establishes a cooperative relationship between WS and the NJDOH and outlines roles and responsibilities for resolving wildlife damage management situations. The NJDOH provides technical guidance to WS on public health related issues and potential health problems associated with wildlife and refers callers with wildlife damage related questions to WS.

New Jersey Agricultural Experiment Station (NJAES), Rutgers, The State University (RSU)

The NJAES RSU currently has an MOU with WS, which establishes a cooperative relationship between WS and the NJAES and outlines roles and responsibilities for resolving wildlife damage management situations. NJAES RSU provides educational, outreach, and extension information to citizens and provides educational sessions and courses on wildlife issues.

1.7 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

Environmental Assessment – Reducing Mammal Damage through an Integrated Wildlife Damage Management Program in the State of New Jersey: WS developed an EA that analyzed the environmental effects of WS' involvement in MDM in New Jersey (USDA 2004) and a Supplement in 2011 (USDA 2011). That EA identified the issues associated with managing mammal damage in New Jersey and analyzed alternative approaches to meet the specific need identified in the EA while addressing the identified issues. Since activities conducted under the previous EA will be re-evaluated

under this EA to address the new need for action and the associated affected environment, the previous EA will be superseded by this analysis and the outcome of the Decision issued based on the analyses in this EA.

Environmental Impact Statement – Feral Swine Damage Management: A National Approach: APHIS and cooperating agencies previously prepared an EIS that addressed feral swine damage management in the United States, American Samoa, Mariana Islands, United States Virgin Islands, Guam, and Puerto Rico (USDA 2015). The Record of Decision selected the preferred alternative in the EIS to implement a nationally coordinated program that integrates methods to address feral swine damage. In accordance with the Record of Decision, WS developed this EA to be consistent with the EIS and the Record of Decision.

Proposal to Permit Take as provided under the Final Programmatic Environmental Impact Statement for the Eagle Rule Revision: Developed by the USFWS, this EIS 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 EIS evaluated the management on an eagle management unit level (similar to the migratory bird flyways) to establish limits on the amount of eagle take that the USFWS could authorize in order to maintain stable or increasing populations. This alternative further establishes a maximum duration for permits of 30 years with evaluations in five year increments (USFWS 2016). A Record of Decision was made for the preferred alternative in the EIS. The selected alternative revised the permit regulations for the "take" of eagles (see 50 CFR 22.26 as amended) and a provision to authorize the removal of eagle nests (see 50 CFR 22.27 as amended). The USFWS published a Final Rule on December 16, 2016 (81 FR 91551-91553).

1.8 SUMMARY OF PUBLIC INVOLVEMENT

Issues related to management of damage and threats associated with mammals and the alternatives to address those issues were initially developed by WS. Issues were defined and preliminary alternatives were identified through the scoping process. As part of this process, and as required by the CEQ and APHIS' NEPA implementing regulations, this document was made available to the public through legal notices published in local print media, through direct mailings to parties that have requested to be notified or have been identified to have an interest in the reduction of threats and damage associated with mammals, and by posting the EA on the APHIS website at http://www.aphis.usda.gov/wildlifedamage/nepa.

WS provided 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 clearly communicated 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 were fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final Decision or publication of a notice of intent to prepare an EIS.

1.9 RATIONALE FOR PREPARING AN EA RATHER THAN AN EIS

WS has the discretion to determine the geographic scope of their analyses under the NEPA. 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 FONSI. In terms of considering cumulative effects, one EA analyzing impacts for the entire state will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. As most mammals are regulated by the NJDFW, the best available data for analysis is often based on statewide population dynamics. For example, an EA on the county level may not have sufficient data for that area and would have to rely on statewide analysis anyway. 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.

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 non-native invasive species are not protected under state or federal law. Most resident wildlife species are managed under state authority or law without any federal oversight or protection. Federal protection is provided for species on the Endangered Species Act (ESA). In some states, with the possible exception of restrictions on methods (e.g., firearms restrictions, pesticide regulations), unprotected wildlife species and certain resident wildlife species are managed with little or no restrictions. This means that they can be killed or taken by anyone at any time when they are committing damage. For mammal damage management, the NJDFW has the authority to manage and authorize the taking of mammals for damage management purposes, with the exception of species protected under the ESA.

When a non-federal entity (e.g., agricultural producers, municipalities, counties, private companies, individuals, or any other non-federal entity) takes a mammal damage management 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 federal action being proposed. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards mammals should occur and even the particular methods that should be used, WS' involvement in the action would not affect the environmental status quo because the entity could take the action in the absence of WS' involvement. WS' involvement would not change the environmental status quo if the requestor had conducted the action in the absence of WS' involvement in the action.

1.10 COMPLIANCE WITH LAWS AND STATUTES

Several laws and regulations pertaining to wildlife damage management activities, including activities that could be conducted in the state are discussed below. Those laws and regulations relevant to mammal damage management activities are addressed below:

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 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.

Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703-711; 40 Stat. 755), as amended

The Migratory Bird Treaty Act (MBTA) makes it unlawful to, "*to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase*" some migratory bird species, or their parts, nests, or eggs (16 USC 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13. All actions conducted in this EA comply with the regulations of the MBTA, as amended.

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 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 USFWS to issue permits for the take of bald eagles and golden eagles on a limited basis (see 81 FR 91551-91553, 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.

Endangered Species Act (ESA)

The ESA recognizes that our natural heritage is of "*esthetic, ecological, educational, recreational, and scientific value to our Nation and its people*." The purpose of the Act is to protect and recover species that are in danger of becoming extinct. Under the ESA, species may be listed as endangered or threatened. Endangered is defined as a species that is in danger of becoming extinct throughout all or a significant portion of its range while threatened is defined as a species likely to become endangered in the foreseeable future. Under the ESA, "*all federal departments and 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)). Additionally, the Act requires that, "*each Federal agency shall in consultation with and with the assistance of the Secretary, insure that any action authorized, funded or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species……each agency will use the best scientific and commercial data available*" (Sec.7 (a) (2)). WS consults with the USFWS to ensure that the agency's actions, including the actions proposed in this EA, are not likely to jeopardize the existence of T&E species or their habitat.

National Historic Preservation Act (NHPA) of 1966, as amended

The NHPA and its implementing regulations (36 CFR 800) require federal agencies to initiate the section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106. None of the MDM methods described in this EA that might be used operationally by WS causes major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the alternatives 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, the site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Noise-making methods, such as firearms, that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing wildlife have the potential for audible effects on the use and enjoyment of historic property. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage problem, which means such use would be to the benefit of the historic property. A built-in factor for this issue is that virtually all 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 the Section 106 of the NHPA would be conducted as necessary in those types of situations.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 92-583, October 27, 1972; 86 Stat. 1280)

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to federal approval of their plans, grants

would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity. As appropriate, a consistency determination would be conducted by WS to assure management actions would be consistent with the state's Coastal Zone Management Program established under the Coastal Zone Management Act.

Environmental Justice in Minority and Low Income Populations (Executive Order 12898)

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. 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. All activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS would only use or recommend legal, effective, and environmentally safe methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income.

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

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. WS 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 activities would occur by using only legally available and approved methods where it would be 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 the proposed action or the alternatives. Additionally, since the proposed mammal damage management program is directed at reducing human health and safety risks at locations where children are sometimes present, it is expected that health and safety risks to children posed by mammals would be reduced.

Invasive Species (Executive Order 13112)

Executive Order 13112 directs federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm or harm to human health. The Order states that each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law: 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations and provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control and promote public education of invasive species.

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.

Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "*Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected.*" This standard includes mammals that may cause safety and health concerns at workplaces.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods, described in Appendix D, are registered with and regulated by the EPA and used or recommended by WS in compliance with labeling procedures and requirements.

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 DEA to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994

The Animal Medicinal Drug Use Clarification Act and its implementing regulations (21 CFR 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in damage management programs. Those requirements are: (1) a valid "*veterinarian-client-patient*" relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under any alternative where WS could use those immobilizing and euthanasia drugs. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (i.e., a period 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. WS would establish procedures for administering drugs used in wildlife capture and handling that would be approved by state veterinary authorities in order to comply with this law.

Clean Water Act (Section 404)

Section 404 (33 U.S.C. 1344) of the Clean Water Act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the USACE unless the specific activity is exempted in 33 CFR 323 or covered by a nationwide permit in 33 CFR 330. The breaching of most beaver dams is covered by these regulations (33 CFR 323, 33 CFR 330).

Food Security Act

The Wetland Conservation provision (Swampbuster) of the 1985 (16 USC 3801-3862), 1990 (as amended by PL 101-624), and 1996 (as amended by PL 104-127) farm bills require all agricultural producers to protect wetlands on the farms they own. Wetlands converted to farmland prior to December 23, 1985 are not subject to wetland compliance provisions even if wetland conditions return as a result of lack of maintenance or management. If prior converted cropland is not planted to an agricultural commodity (crops, native and improved pastures, rangeland, tree farms, and livestock production) for more than 5 consecutive years and wetland characteristics return, the cropland is considered abandoned and then becomes a wetland subject to regulations under Swampbuster and Section 404 of the Clean Water Act. The Natural Resource Conservation Service is responsible for certifying wetland determinations according to this Act.

New Jersey Wildlife Laws: Regulations and Policies Regarding Mammal Damage Management

<u>New Jersey Statutes Annotated (NJSA) Title 23 contains fish, game and wildlife law for the State of New Jersey:</u>

1. State Threatened and Endangered Species (NJSA 23:2A-3, 4, and 6): Establishes a list of wildlife species designated by the State of New Jersey as threatened and endangered and imparts additional protection for those species
2. Damage Caused by Squirrels and Rabbits (NJSA 23:4-9): Trapping via box traps or shooting of squirrels, rabbits or hares are permitted by farmers and fruit growers during the entire year after providing affidavit about damage to crops or nursery stock.
3. Prohibited Hunting Practices (NJSA 23:4-16): 1) Hunting, shooting, or pursuing wildlife from within or on a motor vehicle, or by the aid or use of a light on or attached to the vehicle, is not a legal means. 2) In order for any person, except the owner or lessee of a building, to possess a loaded firearm within 450 feet or nocked arrow within 150 feet of any occupied building, for the purposes of hunting, taking, or killing of any animal; written authorization from the owner/lessee is required. “Occupied building" means any building constructed or adapted for overnight accommodation of a person, or for operating a business or engaging in an activity therein, whether or not a person is actually present.
4. Sunday Hunting (NJSA 23:4-24.a and b): No person shall hunt with a hound or with firearms or weapons of any kind, or carry a gun in the woods or fields or on the waters on Sunday. Exceptions include: a person raccoon hunting prior to sunrise, a person humanely dispatching legally trapped furbearing animals, a person bow-hunting during bow and arrow hunting season on a State wildlife management area or on private property, and farmers carrying out control methods on their lands.
5. Take of an Animal near Bait (NJSA 23:4-24.2, 3 and 4): Shooting or taking of an animal (with the exception of deer) is prohibited within 300 feet of a baited area while elevated in a standing tree or in a structure of any kind. Growing and unharvested crops are not considered bait.
6. Leg-Hold Traps (NJSA 23:4-22.1 and 2): Bans the possession and use of leg-hold traps in the State.

7. Conibear Traps (NJSA 23:4-38.2): Conibear traps must be submerged under water, while in use for trapping. In tidal water, Conibear traps must be completely covered by water at normal high tide.
8. Deer Removal Outside of the Established Hunting Season (NJSA 23:4-42): Describes options for lethally controlling deer. 1) Farmer may apply for a permit when deer are causing crop damage. Permit allows shooting any time of day and allows for illuminating devices to be used. 2) A County Board of Agriculture, county/municipal governing body, or owner or operator of an airport may submit to the NJDFW for its approval a Community Based Deer Management Plan (CBDMP) and application for designation of a special deer management area. Exemptions or variations from certain laws, rules and regulations may be authorized in the implementation of alternative control methods set forth in an approved CBDMP. Implementation of the CBDMP occurs as regulated by the NJDFW (NJAC 7:25-5.32). 3) NJDFW shall issue a Special Deer Management Permit to applicants authorized to carry out alternative control methods written in an approved CBDMP.
9. Liberating a Fox or Coyote (NJSA 23:4-57 and 63.1): No person shall liberate a fox or coyote within the State.
10. Release of Indigenous or Exotic Animals (NJSA 23:4-63.3 and 4): Except as authorized pursuant to a permit issued by the NJDEP, or as provided for by the "Administrative Procedures Act", it is not legal to release indigenous or exotic animals into the environment.
11. Noise Making Devices (NJSA 23:4-63.5 and 6): Agricultural landowners may use noise making and other mechanical devices to scare or repel damaging wildlife in order to prevent the damage and destruction of crops and other property. The NJDFW shall issue permits to authorize this use.

<u>NJSA Title 2C contains The New Jersey Code of Criminal Justice:</u>

1. Identification Card (NJSA 2C:39-5c(l) and 58-3): A person in possession of a rifle or shotgun must first obtain a firearms purchaser identification card (FID). Exemptions to this are contained in NJSA 2C:39-6. For example, a(2) states exempt persons include "*Federal law enforcement officers, and any other federal officers and employees required to carry firearms in the performance of their official duties*."
2. Prohibited Weapons and Devices (NJSA 2C:39-3 (c) and (g)): Any person who knowingly has in their possession any firearm silencer is guilty of a fourth degree crime. Exceptions include any person specifically identified on a Special Deer Management Permit issued by the NJDFW to utilize a firearm silencer as part of an alternative deer control method.

<u>The New Jersey Administrative Code (NJAC) Title 7 contains regulations necessary to implement laws</u>:

1. Noise Making Devices (NJAC 7:25 Subchapter 3): Describes the process to obtain a permit from the NJDFW to use propane/acetylene/carbide exploders to harass mammals away from agricultural crops.
2. Nongame and Exotic Wildlife (NJAC 7:25 Subchapter 4): The NJDFW Endangered and Nongame Species Program (ENSP) may issue permits for the possession of nongame species (NJAC 7:25-4.2(a)) and for the control of nongame species which are creating a hazard to public safety, crops, livestock, or similar concerns (NJAC 7:25-4.6(a)(12)).
3. NJ Game Code (NJAC 7:25 Subchapter 5): Establishes procedures and regulations pertaining to hunting, trapping, and take of game species in New Jersey. Pertinent regulations regarding mammal damage management in the State Game Code are as follows:
    a. Nuisance Species (NJAC 7:25-5.21): People suffering damage from squirrel, raccoon, opossum, skunk, weasel, woodchuck, gray fox, red fox and coyote, or their agents designated in writing, may take these species by lawful procedures to control damage. Take of coyotes must be reported to the NJDFW Regional Law Enforcement Office within 24 hours.

b. Enclosed Foot-Hold Traps (NJAC 7:25-5.12 (g)): Enclosed foothold traps may be used to harvest furbearing animals during the prescribed open seasons.
c. Firearm Capacity (NJAC 7:25-5.23(c)): Except as provided for agents and/or permittees operating under an approved Special Deer Management Permit, a shotgun or rifle capable of holding more than three shells/cartridges is prohibited.
d. WS Use of Air Rifle and Rifle (NJAC 7:25-5.23(u)): The NJDFW may authorize WS to shoot wildlife with an air rifle (.22 caliber or smaller) or a rifle (.22 caliber or as approved by the NJDFW) as long as the method is specifically listed on a State Depredation Control Permit, Special Wildlife Management Permit and/or a Federal Fish and Wildlife Permit co-signed by the NJDFW.
e. Special Wildlife Management Permits (NJAC 7:25-5.32(a and b)): The NJDFW may issue Special Wildlife Management Permits for the taking of any game species, indigenous animal, exotic animal, and potentially dangerous animal by any lawful manner and means. The NJDFW shall consider data such as damage being done to crops or property, the hazard posed to safe airport operations, the biological condition of the animal or any other special management problem.
f. Special Deer Management Permits (NJAC 7:25-5.32(d)): NJDFW may designate special deer management areas and issue Special Deer Management Permits as part of an approved CBDMP per the requirements written in this subsection.
g. Deer Management Assistance Program Permits (NJAC 7:25-5.36): NJDFW may issue Deer Management Assistance Program Permits for the taking of antlerless deer during qualified hunting seasons for properties experiencing problems in management zones with a limited antlerless bag limit or if the regular zone permits are sold out.
h. Permits for Administration of Chemicals to Wildlife (NJAC 7:25-5.22(a)(1)): A person must obtain a permit from the NJDFW prior to administering chemical or biological substances (i.e., drugs, pesticides, vaccines, immobilizing drugs, growth stimulants) or affixing any device to free ranging wildlife.
i. Special Permit to Inhibit Wildlife Reproduction (NJAC 7:25-5.37): Fertility control materials and/or methodologies administered or employed to any free wildlife requires a permit approved and issued by the NJDFW.

4. Deer Permit for Farmers (NJAC 7:25 Subchapter 23): The NJDFW may issue a permit to NJ farmers (land owners or lessees) on cultivated lands to kill wild deer causing damage to seeded cultivated grasses, planted crops, nursery stock, or orchards.

<u>Policies of the NJDFW regarding wildlife damage management.</u>

The NJDFW Policy on Relocation of Wildlife is implemented to ensure that human activities relating to the movement and release of wildlife do not negatively affect human health and safety, agriculture and local wildlife populations. The NJDFW authority to control releases is found in NJSA 23:4-63.3 and 64.4 and NJAC 7:25 subchapters 4 and 10. The policy sets standards for release of all species, and considers biological and social issues. For mammals, releases should occur on site or within 2 miles of the capture site. For rabies vector species (raccoons, skunks, fox and woodchuck), in situations where release at the capture site is not possible, adult animals must be released within the township of origin but not greater than 10 miles away for raccoons and 5 miles for skunks and woodchucks. Landowner permission must be obtained prior to release/relocation of mammals. Regarding nuisance wildlife, damage management techniques such as exclusion and habitat management are emphasized so that the animal may be released onsite. However, if release on site or relocation of a nuisance animal will create a new problem, euthanasia of the problem animals should be considered using methods found acceptable in the most recent report of the American Veterinary Medical Association's (AVMA) Guidelines on Euthanasia.

New Jersey Pesticide Laws

New Jersey's pesticide regulations, NJAC Title 7 Chapter 30, Subchapters 1-12, are implemented and enforced by the NJDEP C&E. These regulations include processes and requirements for pesticide product registration (Subchapter 2), certification of pesticide dealers, licensing of pesticide dealer businesses, licensing of commercial pesticide operators and applicators, licensing of pesticide applicator businesses, certification of private pesticide applicators, pesticide exposure management, pesticide use, grace period regulations, and agricultural worker protection. In order for WS to apply a restricted use pesticide as part of mammal damage management in NJ, the product must be registered with the NJDEP C&E, the applicator must be licensed, and if a fee is charged, the agency possess a NJ pesticide applicator business license. Additionally, label instructions and all other pesticide and wildlife laws and regulations must be adhered to (e.g., possession of a depredation permit from the NJDFW to take the protected mammal species). Pesticide products are registered annually, and applicator licenses are obtained and maintained through completion of training courses and examinations conducted through the NJDEP C&E.

CHAPTER 2: DEVELOPMENT OF ALTERNATIVES

Chapter 2 contains a discussion of the issues that have driven the development of SOPs and alternatives to address mammal damage. This chapter also contains a description of the IWDM strategies that are typically used to manage wildlife damage, including a description of WS' operational, technical and research assistance and the decision model used to resolve wildlife complaints. The issues, management strategies and SOPs collectively formulated the alternatives.

2.1 ISSUES ADDRESSED IN THE ANALYSIS OF THE ALTERNATIVES

Issues are concerns of the public and/or professional community raised regarding potential adverse effects that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues related to managing damage and other issues associated with mammals in New Jersey were developed by WS through discussions with partnering agencies, cooperators and stakeholders.

The issues as they relate to the possible implementation of the alternatives, including the proposed action, are discussed in detail in Chapter 3. The issues analyzed in detail are the following:

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

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations of target species. Methods available to resolve damage or threats of damage can be categorized as lethal and nonlethal. Nonlethal methods disperse or otherwise make an area where damage is occurring unattractive or unavailable to the species causing the damage, thereby reducing the presence of those species in the immediate area. Although nonlethal methods do not physically harm wildlife, harassment of T&E species is considered "take" under the New Jersey Endangered and Nongame Species Conservation Act and ESA. Lethal methods remove individuals of target species causing the damage, thereby reducing the presence of those species in the area and reducing the local population. The number of target species lethally removed under the alternatives is dependent upon the magnitude of the damage occurring, the level of damage acceptable to individual persons experiencing the damage, the numbers of individual animals involved, 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 and/or status (e.g. nuisance species, game species, etc.). Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Lethal methods would only be used by WS at the request of those persons seeking assistance and only after authorization, when required, has been provided by the NJDFW for the lethal take. Lethal removal of wild mammals could occur at any time or during hunting and trapping seasons. Therefore, any mammal damage management activities conducted by WS under the alternatives addressed would be occurring along with other natural process and human-induced events such as natural mortality, human-induced mortality from private damage management activities, mortality from regulated harvest, and human-induced alterations of wildlife habitat.

Issue 2 - Effects of Damage Management Activities on Nontarget Wildlife Species Populations, Including T&E Species

A common issue when addressing damage caused by animals are the potential impacts of management actions on nontarget species, including T&E species. Nonlethal methods have the potential to inadvertently disperse or otherwise impact nontargets. Lethal methods remove individuals of the species causing the damage, thereby reducing the presence of those species in the area and the local population. However, lethal methods also have the potential to inadvertently capture or kill nontargets.

The ESA is a federal legislation that makes it illegal for any person to '*take*' any listed T&E species or their critical habitat. The ESA defines take as, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC 1531-1544). Critical habitat is a specific geographic area or areas that are essential for the conservation of a T&E species. The ESA requires that federal agencies conduct their activities in a way to conserve species. It also requires that federal agencies consult with the USFWS prior to undertaking any action that may take listed T&E species or their critical habitat pursuant to Section 7(a)(2) of the ESA. At the state level, New Jersey Endangered and Nongame Species Conservation Act of 1973 (NJSA 23:2A *et seq.)* establishes a list of wildlife species designated by the State of New Jersey as threatened and endangered. A separate New Jersey State law, the Endangered Plant Species List Act (NJSA 13:1B *et seq.*), establishes an official list of endangered plants.

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 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 3 of this EA will discusses the potential for WS' activities to disturb eagles as defined by the Act.

Issue 3 – Effects of Damage Management on Regulated Harvest of Mammals

Another issue commonly identified as a concern is that damage management activities conducted by WS could affect the ability of hunters or trappers to harvest species targeted by management activities. Potential impacts could arise from both lethal and nonlethal damage management methods. Nonlethal methods disperse or otherwise make an area where damage is occurring unattractive to the species causing the damage, thereby reducing the presence of those species in the area. Lethal methods remove individuals of the species causing the damage, thereby reducing the local population and the presence of

those species in the area. Therefore, lethal methods could reduce the local population or the presence of harvestable species in the area where damage management activities are occurring. In New Jersey, black bear, beaver, coyote, eastern cottontail, eastern gray squirrel, feral swine, gray fox, mink, muskrat, nutria, raccoon, river otter, striped skunk, Virginia opossum, white-tailed deer, and woodchuck may be harvested by hunters and trappers.

Issue 4 - Effects of Damage Management Activities on Human Health and Safety

An additional issue often raised is the potential risks to human safety associated with employing methods to manage damage caused by the target species. Both chemical and nonchemical methods have the potential to have adverse effects on human health and safety. Risks can occur to persons employing methods, to persons coming into contact with methods, or to persons harvesting and then consuming animals which have been previously immobilized with drugs. Risks can be inherent to the method itself or related to the misuse of the method.

The cooperator requesting assistance would be made aware through a MOU, CSA, or a similar document that those devices 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 of Chemical Methods Employed

Potential risks to human health and safety associated with chemical methods are related to the potential for human exposure either through direct or indirect contact with the chemical. Under the alternatives identified, the use of chemical methods would include immobilizing drugs, euthanasia drugs, reproductive inhibitors, fumigants, toxicants, and repellents. These methods are further discussed in Appendix D.

The use of chemical methods is strictly regulated by the DEA, EPA, FDA, NJDEP, and WS' Directives. Restricted use chemicals can only be applied by persons who have been specially trained and certified by the NJDEP for their use. These persons (certified applicators) are required to take continuing education credits and exams to maintain their certification. All of the chemical methods listed above, including methods available for use to the public, have specific requirements for their handling, transport, storage, use and disposal under the New Jersey Administrative Code.

Safety of Nonchemical Methods Employed

Most methods available to manage damage and threats associated with mammals are considered nonchemical methods. Nonchemical methods may include, but are not limited to, exclusion, habitat modifications, harassment, frightening devices, live-traps, body-gripping traps and firearms. A complete list of nonchemical methods available to alleviate damage associated with mammals is provided in Appendix D of this EA. Like chemical methods, nonchemical methods, if misused, could potentially be hazardous to human health and safety. The primary safety risk of most nonchemical methods occurs directly to the person employing the method. However, risks to others do exist when employing nonchemical methods, such as when using firearms.

Issue 5 - Humaneness and Animal Welfare Concerns

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 but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate damage management for

societal benefits could be compatible with animal welfare concerns, if *"…the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

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

Defining pain as a component in humaneness appears to be a greater challenge than that of suffering. Pain obviously occurs in animals, but assessing pain experienced by animals can be challenging (California Department of Fish and Game 1991; AVMA 2013). 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 that 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 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.

2.2 DAMAGE MANAGEMENT STRATEGIES AVAILABLE FOR ALTERNATIVES

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 nontarget 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.

The IWDM Strategies Employed by WS

Direct Damage Management Assistance
Direct damage management assistance includes damage management activities that are directly conducted or supervised by WS personnel. Direct operational assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and when a MOU, CSA, or other comparable document 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.

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 with no direct involvement by WS. 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/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 the 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.

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. WS routinely disseminates recommendations and information to individuals sustaining damage. Additionally, WS provides lectures, courses, and demonstrations related to wildlife damage management and disease issues to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS 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 they are respected world-wide for their expertise in wildlife damage management.

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 2:1). WS personnel are frequently contacted after requesters have tried or considered nonlethal 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.

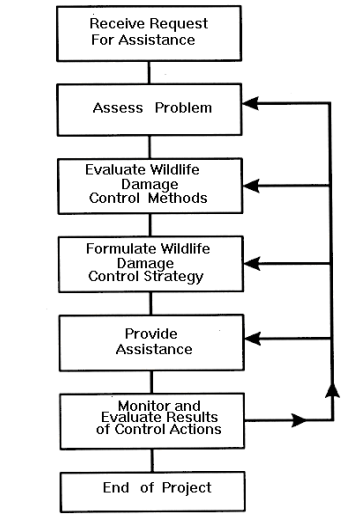

Figure 2:1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with Human-wildlife conflicts.

Community-based Decision Making
The WS program 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 nonlethal 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 MDM activities. This process allows decisions on MDM activities to be made based on local input. They may implement management recommendations provided by WS or others on their own, or they may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

2.3 STANDARD OPERATING PROCEDURES FOR MAMMAL DAMAGE MANAGEMENT

WS' directives and SOPs improve the safety, selectivity and efficacy of animal damage management activities. WS' directives and SOPs would be incorporated into activities conducted by WS when addressing damage and threats associated with mammals.

Some key SOPs pertinent to the proposed action and alternatives include the following:

- The WS Decision Model, which is designed to identify effective wildlife damage management strategies and their impacts, would be consistently used and applied when addressing mammal damage.

- EPA-approved label directions would be followed for all pesticide use. All pesticides and repellants used would be registered by the NJDEP. The registration process for chemical pesticides is intended to assure minimal adverse effects occur to the environment when chemicals are used in accordance with label directions.

- All controlled substances would be registered with the DEA or the FDA. WS' employees that use controlled substances would be trained to use each material and are certified to use controlled substances.

- WS' employees who use pesticides and controlled substances would participate in state-approved continuing education to keep current of developments and maintain their certifications.

- Immobilizing and euthanasia drugs would be used according to the DEA, FDA, and WS' directives and procedures. WS' employees would follow approved procedures outlined in the WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001).

- Safety Data Sheets for pesticides and controlled substances would be provided to all WS' personnel involved with specific damage management activities.

- All personnel who use firearms would be trained according to WS' Directives and WS Firearm Policy.

- WS' use of traps, snares (cable devices) or other devices would comply with WS Directive 2.450.

- Direct operational assistance would only be conducted by WS after a MOU, CSA, or other comparable document listing all the methods the property owner or manager will allow to be used on property they own and/or manage was signed by WS and those requesting assistance.

- Carcasses of animals retrieved after damage management activities would be disposed of in accordance with WS Directive 2.515 and applicable permits.

- WS' personnel would use bait, trap placements and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of nontarget animal captures.

- WS would comply with all applicable federal, state, and local laws and regulations in accordance with WS Directive 2.210.

2.4 ADDITIONAL STANDARD OPERATING PROCEDURES SPECIFIC TO THE ISSUES

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

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

- Lethal removal of wild mammals by WS would be monitored by the NJDFW to ensure cumulative lethal removal is considered as part of population management objectives

- The take of mammals under the alternatives would only occur when authorized by the NJDFW, when applicable, and only at levels authorized.

- WS will not target feral or free-ranging dogs and cats with lethal control techniques. Targeted feral or free-ranging dogs and cats will be live captured and transported to a local animal pound/shelter (WS New Jersey Policy on Feral, Free-ranging, and Hybrid Dog Damage Management per WS Directive 2.340).

- Management actions would be directed toward localized populations or groups of target species and/or an individual of those species. Generalized population suppression across New Jersey, or even across major portions of New Jersey, would not be conducted with the exception of exotic and/or invasive species.

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

Issue 2 - Effects of Damage Management Activities on Nontarget Wildlife Species Populations, Including T&E Species

- Personnel would be present during the use of live-capture methods other than traps to ensure nontarget and T&E species are released immediately or are prevented from being captured. Live-traps would be checked frequently in accordance with NJ Game Code (NJAC 7:25-5.12 (i)).

- Nontarget animals captured in traps would be released unless it is determined that the animal would not survive and/or that the animal cannot be released safely.

- WS would review the current federal T&E species list for New Jersey each year to determine if new species have been added and will evaluate potential impacts to those species from mammal damage management activities.

Issue 3 - Effects of Damage Management Activities on Regulated Harvest of Mammals

- The lethal removal of wild mammals by WS could only occur within the parameters established by the NJDFW and would be monitored by the NJDFW to ensure cumulative lethal removal is considered as part of population management objectives.

Issue 4 - Effects of Damage Management Activities on Human Health and Safety

- Damage management activities would be conducted away from areas of high human activity. If this is not possible, then activities would be conducted during periods when human activity is low (*e.g.*, early morning), when possible.

- Shooting would be conducted during time periods when public activity and/or access to the control areas are restricted, when possible. Personnel involved in shooting operations would be fully trained in the proper and safe application of this method.

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

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

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

- Appropriate warning signs will be posted in accordance with WS Directive 2.450.

Issue 5 - Humaneness and Animal Welfare Concerns

- WS personnel would be trained in the latest and most humane devices and methods for removing mammals.

- WS' use of immobilization and euthanasia methods would comply with WS Directive 2.505 and WS Directive 2.430.

- WS' use of all traps, snares (cable devices), and other capture devices would comply with WS Directive 2.450.

- WS personnel shall only utilize trained locator dogs (dogs proficient in the skills necessary to perform specific functions in a manner that is responsive to its handler's commands) in accordance with WS Directive 2.445.1.

2.5 ALTERNATIVES

Alternatives were developed for consideration based on the need for action and issues using the WS Decision model (Slate et al. 1992). The alternatives will receive detailed environmental impacts analysis in Chapter 3 (Environmental Consequences). Chapter 2 also discusses alternatives considered but not analyzed in detail, with rationale. The following alternatives were developed to meet the need for action and address the identified issues associated with managing damage caused by mammals in New Jersey:

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 nonlethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats associated with mammals. Under this alternative, WS could respond to requests for assistance for managing damage and threats associated with mammals by: 1) taking no action, if warranted, 2) providing technical assistance to property owners or managers on

actions they could take to reduce damage or threats of damage, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage or threats of damage. Direct operational assistance could be provided when funding is available through federal appropriations or cooperative funding. WS response to requests for assistance is dependent upon on those persons initiating the request.

Property owners or managers requesting assistance would be provided with information regarding the use of effective and practical nonlethal and lethal techniques under this alternative. Property owners or managers may choose to implement WS' recommendations on their own (*i.e.*, technical assistance), use contractual services of private businesses, use volunteer services of private individuals or organizations, use the services of WS (*i.e.*, direct operational assistance), take the management action themselves without consulting another private or governmental agency, or take no action. Direct operational assistance would only be conducted by WS after a MOU, CSA, or other comparable document listing all the methods the property owner or manager will allow to be used on property they own and/or manage was signed by WS and those requesting assistance.

The most effective approach to resolving any animal damage problem is to use an adaptive integrated approach (IWDM) that may call for the use of several methods simultaneously or sequentially. This approach is used by WS for providing both technical and direct operational assistance. WS personnel use a thought process for evaluating and responding to requests for assistance detailed in the WS Decision Model (See Wildlife Services Decision Making). IWDM may incorporate both nonlethal and lethal methods depending upon the circumstances of the specific damage problem. Nonlethal methods disperse or otherwise make an area where the damage is occurring unattractive or unavailable to the species causing the damage, thereby reducing the presence of those species in the area. Nonlethal methods would be given priority when addressing requests for assistance (WS Directive 2.101). However, nonlethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model. For example, if those requesting assistance have already used nonlethal methods, WS would not likely recommend or continue to employ those particular methods because their use has already been proven ineffective in adequately resolving the damage or threat. When effective, nonlethal methods would disperse mammals from the area resulting in a reduction in the presence of those mammals at the site.

Lethal methods remove individuals of the species causing the damage, thereby reducing the presence of those species in the area and the local population. Lethal methods are often employed or recommended to reinforce nonlethal methods and to remove mammals that have been identified as causing damage or posing a threat of damage as part of an integrated approach. The number of mammals removed from the population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of mammals involved with the associated damage or threat, and the efficacy of methods employed. WS may recommend mammals be harvested during regulated hunting and/or trapping seasons or lethally removed under nuisance wildlife regulations in an attempt to reduce the number of mammals causing damage. Appendix D contains a thorough discussion of the methods available for use in managing damage and threats associated with mammals under this alternative. All methods listed in Appendix D would be available under this alternative although not all methods would be available for direct implementation by all persons.

Alternative 2 – WS Would Address Mammal Damage Using Technical Assistance Only

Under this alternative, WS would provide those persons requesting assistance with managing damage and threats associated with mammals with technical assistance only. Technical assistance would be provided as described above under Alternative 1. Appendix D contains a thorough discussion of the methods available for use in managing damage and threats associated with mammals. All methods listed in

Appendix D could be available under this alternative although not all methods would be available for direct implementation by all persons.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent damage associated with mammals as permitted by federal, state, and local laws and regulations or those persons could take no action.

Alternative 3 – No Mammal Damage Management Conducted by WS

This alternative would preclude any and all activities by WS to reduce threats to human health and safety, and to alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of mammal damage management. All requests for assistance received by WS to resolve damage caused by mammals would be referred to the NJDFW, NJDEP, local law enforcement or animal control authorities, and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage caused by mammals could continue to resolve damage by employing those methods legally available since the lethal removal of mammals to alleviate damage or threats can occur despite the lack of involvement by WS. The lethal removal of mammals could occur through the issuance of permits by the NJDFW, when required, and during the hunting or trapping seasons. All methods listed in Appendix D would be available under this alternative although not all methods would be available for direct implementation by all persons. Immobilizing drugs and euthanasia chemicals can only be used by those operating under an appropriately licensed veterinarian, and reproductive inhibitors (GonaCon™) can only be used by WS or state wildlife management agencies.

2.6 ALTERNATIVES NOT CONSIDERED IN DETAIL

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:

Nonlethal Methods Implemented Before Lethal Methods

This alternative would require that all nonlethal methods or techniques described in Appendix D be applied to all requests for assistance to reduce damage and threats to safety from mammals. If the use of all nonlethal 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. Nonlethal 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 nonlethal methods had been employed.

Those persons experiencing damage or threats often employ nonlethal methods prior to contacting WS for assistance. 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 nonlethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of nonlethal methods can be evaluated. The proposed action (Alternative 1) is similar to a nonlethal before lethal alternative because the use of nonlethal methods is considered before lethal

methods by WS (WS Directive 2.101). Adding a nonlethal before lethal alternative and the associated analysis would not add additional information to the analyses in the EA.

Use Nonlethal Methods Only

Under this alternative, the only methods available for recommendation and use in resolving damage or threats associated with mammals would be the nonlethal methods described in Appendix D. Lethal methods could continue to be used under this alternative by those persons experiencing damage by mammals without involvement by WS. In situations where nonlethal methods were impractical or ineffective to alleviate damage, WS would refer requests for information regarding lethal methods to the NJDFW, local animal control agencies, or private businesses or organizations. Property owners or managers might choose to implement WS' nonlethal recommendations on their own or with the assistance of WS, implement lethal methods on their own, or request assistance (nonlethal or lethal) from a private or public entity other than WS. This alternative was not analyzed in detail since the lethal removal of mammals could continue at the levels analyzed in Alternative 1, despite the lack of WS' involvement.

Use of Lethal Methods Only by WS

Under this alternative, the only methods available for recommendation and use in resolving damage or threats associated with mammals would be the lethal methods described in Appendix D. This is in direct conflict with WS Directive 2.101, which states that WS must consider the use of nonlethal methods before lethal methods. In addition, nonlethal methods can be effective in preventing damage in certain instances. In those situations where damage could be alleviated using nonlethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. Therefore, this alternative was not considered in detail.

Trap and Translocate Mammals Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Mammals would be live-captured using immobilizing drugs, live-traps, or nets (*e.g.*, cannon nets, rocket nets, or drop nets). All mammals live-captured through direct operational assistance by WS would be translocated.

Translocation sites would be identified and have to be pre-approved by the NJDFW and the property owner, where the translocated wild mammals would be placed, prior to live-capture and translocation. Live-capture and translocation could be conducted or recommended as part of the alternatives analyzed in detail, except under the no involvement by WS alternative (Alternative 3). Since WS does not have the authority to translocate wild mammals unless permitted by the NJDFW, this alternative was not considered in detail. In addition, the translocation of wild mammals by WS could occur under any of the alternatives analyzed in detail, except Alternative 3. However, translocation by other entities could occur under Alternative 3. The translocation of dogs or cats is considered animal abandonment and a misdemeanor in New Jersey (NJSA 4:22-20). Therefore, translocation of dogs and cats could not legally occur and was not analyzed further.

Translocation of animals is generally ineffective in reducing damage and would therefore be ineffective at meeting the need for action because animals are highly mobile and can easily return to damage sites from long distances, and translocation may result in damage problems at the new location (Fischer and Lindenmayer 2000; Seddon et al. 2011). Many animals show strong homing behavior (Bradley et al. 2005) and may return to the site after being relocated. Additionally, given the scope of the issue described in the need for action (Chapter 1), it would be unrealistic to translocate the numbers of animals necessary to reduce damage. There is a perception among some individuals that animals which are

translocated because they are causing damage 'live happily ever after' (Craven et al. 1998). Unfortunately however, these animals typically have high mortality rates because of the stress of capture, transport and release, aggression by animals of the same species already occupying the new location, disorientation, unsuitable habitat, difficulties finding resources (food, water, shelter) at the new location, attempts to return to the site of capture and increased susceptibility to predation or disease (Nielsen 1988; Craven et al. 1998; Fischer and Lindenmayer 2000; Seddon et al. 2011). Translocation of animals may also result in the transmission of diseases from one area to another (Nielsen 1988). For these reasons, translocation of wildlife is discouraged by WS Directive 2.501 and was not analyzed further.

Regulated Hunting and Trapping to Manage Damage Associated With Mammals

Under this alternative, all requests for assistance received by WS would be addressed by recommending the use of regulated hunting and trapping to reduce populations of the wild mammals causing damage. The NJDFW is responsible for establishing and enforcing hunting and trapping seasons, bag limits and regulations in the State. Recreational hunting and trapping by private individuals when based on biological information and properly regulated can be effectively used to manage wildlife populations. However, regulated hunting and trapping is often not allowed in all locations where damage occurs (e.g., airports), during times of year when damage occurs (e.g., when agricultural crops are most vulnerable), or may not remove enough animals to reduce the damage (e.g., because of method restrictions).

For example, in urban and suburban areas where hunting of white-tailed deer with firearms is not allowed, archery hunting may provide an alternative method for managing populations. However, in many circumstances it may be difficult to remove a sufficient number of deer using archery hunting alone to reduce the population to a level that sufficiently reduces damage caused by deer (Weckel and Rockwell 2013; Williams et al. 2013). For example, Ver Steeg et al. (1995) found that it was not possible for archery hunting alone to reduce a deer population in a suburban park in Illinois to meet reduction goals. In similar situations in New Jersey and Pennsylvania, Williams et al. (2013) found that despite extended hunting seasons (five months), the use of bait, and no harvest limits, hunting was unable to reduce deer densities to a level that would reduce damage. Hunting in these scenarios is limited in its potential to reduce population levels because: 1) some landowners are unwilling to let hunters on their property, 2) some hunters may desire greater densities for hunting, 3) landowners and hunters may not comprehend the number of deer that must be removed to meet goals, and 4) hunters do not always take precautions to avoid educating deer (i.e., altering deer behavior so that they are less susceptible to hunters) (Williams et al. 2013). Additionally, as deer are harvested the amount of effort to remove additional deer must increase (Weckel and Rockwell 2013) and may be undermined as the number of hunters willing to participate, the number of hunting trips and the length of hunts declines (Wiggers 2011; Weckel and Rockwell 2013).

Regulated hunting and trapping of wild mammals can only occur at the discretion of the NJDFW, which ensures that removal occurs to achieve desired population objectives for each species. Therefore, regulated hunting and trapping could continue to occur under any of the alternatives analyzed in detail at the discretion of the NJDFW. Under Alternative 1 and Alternative 2, WS could recommend, when appropriate, that regulated hunting and/or trapping be used by the resource owner or manager on property they own or manage where damages were occurring. However, allowing regulated hunting and/or trapping would be the decision of the owner or manager of the property. Since WS does not have the ability to require hunting and/or trapping to resolve damage, this alternative was not analyzed in detail.

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

Under this alternative, the only method available to resolve requests for assistance would be the recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in mammals

responsible for causing damage. Reproductive inhibitors are often considered for use where wildlife populations are overabundant and where traditional hunting or lethal control programs are not publicly acceptable (Muller et al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors. Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species.

Currently, no reproductive inhibitors are available for use to manage most mammal populations. GonaCon™ is the only reproductive inhibitor that is registered with the EPA for use in any of the species addressed in this document. GonaCon™ was officially registered by the EPA in 2009 for use in reducing fertility in female white-tailed deer. According to the label, only WS or state wildlife management agency personnel or individuals working under their authority can use GonaCon™. With a NJDFW Special Permit to Inhibit Wildlife Reproduction, WS could use reproductive inhibitors on wild mammals under any of the alternatives analyzed in detail, except Alternative 3. The need to capture or make direct contact with a sufficiently large number of target animals with multiple treatments (in the case of contraceptives) to effectively implement this method places considerable logistic and economic constraints on the adoption of reproduction control as a wildlife management tool for many species. Given these constraints, and the lack of availability of chemical reproductive inhibitors for the management of many species, this alternative was not evaluated in detail.

Compensation for Mammal Damage

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. WS does not have the legal authority to provide financial compensation for damage, only the authority to manage the damage or threats of damage. Under such an alternative, WS would not provide any technical assistance or direct damage management. Aside from lack of legal authority, analysis of this alternative indicates that the concept has many drawbacks (Wagner et al. 1997):

- It would require larger expenditures of money and labor to investigate and validate all damage claims to determine and administer appropriate compensation.

- Compensation would most likely be less than full market value.

- In the case of predation on livestock or pets, compensation may not be a satisfactory solution for individuals who feel responsible for the well-being of their livestock or in situations where there is an emotional attachment to the animal.

- Compensation would give little incentive to resource owners to limit damage through improved cultural, husbandry, or other practices and management strategies.

- Not all resource owners would rely completely on a compensation program and lethal control would most likely continue as permitted by state law.

- Compensation would not be practical for reducing threats to human health and safety.

This EA evaluates different alternatives to meet the need for action. The need for action is to reduce damage and threats associated with mammals. Providing financial compensation to those persons experiencing damage would be ineffective at meeting the need for action because it does not reduce damage and threats. Because providing financial compensation would fail to meet the need for action, this alternative was not considered further.

Bounties

Payment of funds (bounties) for killing some mammals suspected of causing economic losses have not been supported by state agencies, such as the NJDFW, 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. The circumstances surrounding the lethal removal of animals are typically arbitrary and completely unregulated because it is difficult or impossible to assure animals claimed for bounty were not lethally removed from outside the area where damage was occurring. Also, MDM often targets problem individuals or groups of individuals and establishment of a bounty may not resolve conflicts created by those individuals. In addition, WS does not have the authority to establish a bounty program.

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

Under this alternative, Trap-Neuter-Release or Trap-Neuter-Return (TNR) programs would be used to resolve damage or threats associated with feral or free-ranging cats. The implementation of TNR programs would not be recommended by WS to reduce damage and threats for the following reasons:

First, any immediate threats or damage associated with cats continues to persist because animals are not removed from an area. For example, cats will continue to pose a threat to human health and safety at airports from collisions with aircraft (31 collisions were reported in the U.S. in the last 26 years (Dolbeer et al. 2016)) or by transmitting zoonosis. Pathogens and parasites affecting feral cats can have serious implications for human health given the close association of these animals with humans and pets. For example, in 2002, fleas from a feral cat colony which had grown from 100 to 1,000 cats, despite a TNR effort, caused a daycare center at the University of Hawaii in Manoa to close for two weeks because of concerns about the potential transmission of murine typhus and flea infestations afflicting 84 children and faculty (Jessup 2004). A recent study in Pennsylvania found that humans were more likely to come into contact with a rabid cat (29% of human exposure cases) than any other animal except raccoons (35% of human exposure cases) (Campagnolo et al. 2014). In addition to rabies and murine typhus, feral cats carry other zoonotic pathogens that cause diseases such as cat scratch disease, salmonella, plague, tularemia, toxoplasmosis, hookworm, and raccoon roundworm (Gerhold 2011; Gerhold and Jessup 2012).

Additionally, cats will continue to pose a threat to native wildlife if they are left to roam freely. Feral cats (as opposed to owned cats) are the cause of an estimated 69% of the 1.3-4 billion birds killed by cats and 89% of the 6.3-22.3 billion mammals killed by cats each year in the U.S. (Loss et al. 2013). In contrast to claims that well-fed cats pose little threat to wildlife, hunting and hunger are not linked in domestic cats (Adamec 1976); well-fed cats still hunt and kill wildlife (Liberg 1984; Castillo and Clarke 2003; Hutchings 2003). Threatened, endangered or species of concern are of particular risk from cats because for these species, even a small number of fatalities can cause significant population declines (Medina et al. 2011). (Houghton 2005)A study in Westhampton Beach, New York showed predation was the most common cause of nest loss for piping plovers (listed as threatened under the ESA in New Jersey), with cats responsible for 13% of this predation (Houghton 2005). Even if cats don't kill birds, infection from

inflicted wounds or the stress of capture can result in mortality and just the presence of cats can reduce avian reproductive success (Bonnington et al. 2013).

Second, cat populations often remain stable or even increase following TNR programs (Castillo and Clarke 2003; Levy 2004; Winter 2004; Foley et al. 2005; Natoli et al. 2006; Longcore et al. 2009). Although advocates of TNR assert that TNR "works," their definition of success is defined by the welfare of the cats not by a reduction in damage or threats associated with cats or by the elimination of feral cats (Longcore et al. 2009). In contrast, those interested in reducing damage and eliminating threats of damage associated with cats would define success as the elimination of feral cats (e.g., (Jessup 2004; Nogales et al. 2004). For example, the AVMA's Council on Environmental Issues concluded that, "managed cat colonies do not solve the problems of cat overpopulation and suffering, wildlife predation, or zoonotic disease transmission" (Barrows 2004).

Finally, other concerns arise when considering the legality of TNR programs given the documented damage caused, especially to native wildlife (Barrows 2004; Jessup 2004; Levy and Crawford 2004). Some people have questioned whether TNR programs are violating the Migratory Bird Treaty Act and the ESA because released animals may continue to kill migratory birds and/or endangered species (Barrows 2004; Jessup 2004; Levy and Crawford 2004). It has also been questioned whether the release of neutered cats constitutes animal abandonment.

The need for action is to reduce damage and threats associated with mammals including feral or free-ranging cats. The implementation of TNR programs would be ineffective at meeting the need for action because they do not reduce damage and threats associated with feral or free-ranging cats. Because implementing TNR programs would fail to meet the need for action, this alternative was not considered further.

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

Chapter 3 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative in relation to the issues identified. Additionally, this chapter compares the environmental consequences of the proposed action / no action alternative to the environmental consequences of the other alternatives.

Environmental consequences can be direct, indirect, and cumulative.

Direct Effects: Caused by the action and occur at the same time and place.

Indirect Effects: These are impacts caused by an action that are later in time or farther removed in distance, but are still reasonably foreseeable.

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

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.

3.1 ISSUES CONSIDERED IN DETAIL AND THEIR ASSOCIATED ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

The proposed action / no action alternative (Alternative 1) serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS and New Jersey state agencies.

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

The issue of the potential direct and cumulative impacts of conducting the alternatives on the populations of target mammal populations is analyzed for each alternative below.

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

The proposed action / no action alternative would continue the current implementation of an adaptive integrated approach to reduce damage and threats associated with mammals utilizing nonlethal and lethal techniques, as deemed appropriate using the WS Decision Model described in chapter 2.

The issue of the effects on target species arises from the use of nonlethal and lethal methods to address the need for reducing damage and threats; however, the primary concern would be from the use of lethal methods to address damage. Nonlethal methods disperse or otherwise make an area where damage is occurring unattractive or unavailable to the species (target species) causing the damage, thereby reducing the presence of those species in the area. When effective, nonlethal methods would disperse mammals from the area resulting in a reduction in the presence of those animals at the site. However, animals responsible for causing damage or threats are moved to other areas with minimal impact on those species' populations. WS would not employ or recommend these methods be employed over large geographic areas or at such intensity that essential resources would be unavailable and that long term adverse impacts to animal populations would occur. Nonlethal methods are generally regarded as having minimal impacts on overall populations of wildlife because individuals of those species are unharmed. The use of nonlethal methods would not have adverse population impacts under any of the alternatives.

The use of IWDM approved lethal methods, listed in Appendix D, 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 nonlethal 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, the number approved by the regulatory agency that manages the species in question, and the efficacy of methods employed.

The lethal removal of mammals would be monitored by comparing the number of each species lethally removed with that species' overall population trend (when available) and/or the magnitude of lethal removal in comparison to other known lethal take occurring (when available) to assure the magnitude of lethal removal is maintained below the level that would cause adverse effects to the viability of species' populations. Lethal removal of mammals can only occur at the discretion of the NJDFW and the NJDFW ensures lethal removal occurs in compliance with desired objectives. WS's lethal removal of mammals under state permits would be reported annually to the NJDFW. The NJDFW's oversight of permits issued to WS and other entities as well as oversight of trapping/hunting seasons for game species would

ensure that the cumulative removal would not have a negative impact on the statewide wildlife populations.

Population estimates are unavailable for most species of mammals in New Jersey. The potential impacts on mammal populations from the implementation of the proposed action / no action alternative are analyzed for each species below.

Beaver Population Impact Analysis

Beavers can occupy a wide variety of habitats as long as fresh water is present (e.g., streams, rivers, ponds, lakes, bogs, marsh, reservoirs and drainage ditches) (DeGraaf and Yamasaki 2001; Baker and Hill 2003). Most beavers are members of social groups which share the same territory (Baker and Hill 2003). Groups consist of a breeding pair, the young born in the current year and young of the previous 1-2 years (Baker and Hill 2003). In the eastern U.S., a total of three to eight beavers comprise the average group (Novak 1987). A litter consists of three to five young which stay with the colony until they are 1½ to 2 years old and are sexually mature (NJDFW 2014d).

Surveys conducted in the fall of 2015 and 2016 by the NJDFW estimate the average fall beaver population at 7,247 beavers statewide (NJDFW 2017a). The population trend for beavers in New Jersey is increasing. Beavers are established throughout most of New Jersey, excluding the most metropolitan counties of Essex, Hudson, Middlesex, Somerset and Union (NJDFW 2014d).

The number of beavers lethally removed by WS, trappers and/or other entities from 2012 to 2016 is shown in Table 3.1. Beavers are considered a furbearing species and have an established trapping season running from late December to early January. There is a bag limit of eight beavers per permit and a restriction on the number of traps that can be set. New Jersey statutes limit the NJDFW to issuing a maximum of 200 beaver permits for the annual established trapping season. In addition, the NJDFW may issue Beaver Damage Control Permits (DCP) for any time of the year, which allows for additional beaver to be taken at a specific location to control nuisance beaver. However, beavers taken outside of the trapping season under a DCP may not be possessed or sold. Beaver pelts from the trapping season must be checked in with the NJDFW on a pre-determined date a few weeks following the end of the season. An average of 674 pelts were registered annually with the NJDFW from the established trapping seasons during 2011-2012 to 2015-2016. An additional average of 37.5 beaver were taken annually under DCPs issued outside of the trapping season during this timeframe. Between FY 2012 and FY 2016, WS removed an average of one beaver annually.

Table 3.1 - Number of beavers harvested in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Trapper Harvest Under Trapping Permit	Trapper Harvest Under DCP Within Established Season	Harvest Under DCP Outside of Established Season[2]
2011-2012	2	667 [3]	44 [3]	N/A
2012-2013	0	627 [3]	81 [3]	30
2013-2014	0	544 [4]	50 [4]	54
2014-2015	2	599 [5]	61 [5]	39
2015-2016	1	586 [6]	111 [6]	27
Average	**1**	**604.6**	**69.4**	**37.5**

[1] Data reported by federal fiscal year
[2] Data reported by calendar year; (Anthony McBride, NJDFW, personal communication, 2018)
[3] Data reported by state fiscal year[5]; (Andrew Burnett, NJDFW, personal communication, 2018)
[4] Data reported by state fiscal year; (NJDFW 2014b)
[5] Data reported by state fiscal year; (NJDFW 2015a)
[6] Data reported by state fiscal year; (NJDFW 2016)

[5] The state fiscal year begins on July 1 and ends on June 30 the following year.

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 100 beavers could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual trapper and DCP harvest data to assess WS's impacts to the beaver population, WS's removal of 100 beavers would represent 14.05% of the estimated harvest by trappers and DCP holders. When compared to the recent statewide population estimate of 7,247 beaver, WS removal of 100 beavers would represent 1.38% of the population. This level of removal is insignificant and not expected to negatively impact beaver populations.

Like many other mammal species in New Jersey, beavers maintain sufficient population densities to allow for an annual trapping season. The annual WS removal would be of low magnitude since beavers are not considered to be of low density. WS's lethal removal would be a limited component of the species overall harvest and lethal removal. Therefore, WS removal would also be considered of low magnitude when compared to the number of beavers being harvested and lethally removed.

Eastern Chipmunk Population Impact Analysis

The current chipmunk population for New Jersey is unknown; however, the population trend for chipmunks in New Jersey is stable. Population densities of chipmunks are typically 2 to 4 animals per acre but may be as high as 10 animals per acre (Williams and Corrigan 1994). Chipmunks breed twice a year, producing 2 to 5 young in the spring and early fall; young reach sexually maturity within one year (Williams and Corrigan 1994).

Chipmunks are not considered a game, furbearer, or nuisance species in New Jersey. Therefore, lethal removal is only available under a state-issued permit such as a Special Wildlife Depredation Permits and Scientific Collecting Permits. WS did not lethally remove any eastern chipmunks from FY 2012 to FY 2016.

Direct, Indirect, and Cumulative Effects:
In anticipation of an increase in the number of requests for assistance, WS could lethally remove up to 100 eastern chipmunks annually to manage damage or threats of damage and to protect human health and safety. Take of up to 100 eastern chipmunks is not expected to have any adverse impact on the population. Eastern chipmunk populations are not of low density and take would be limited to those individuals deemed causing damage or posing a threat.

Eastern Cottontail Population Impact Analysis

The current cottontail population for New Jersey is unknown; however, the population trend for cottontails in New Jersey is stable. Population density on average is one cottontail per acre (Craven 1994). Cottontails in the southern portion of range have up to six liters per year averaging 2-3 young per litter while in the northern portion of range have up to three liters per year averaging 5-6 young per litter (Craven 1994).

The number of rabbits lethally removed by WS, hunters and/or other entities from 2012 to 2016 is shown in Table 3.2. Rabbits are considered a game species in New Jersey with an established hunting season which runs from late September to late February with some closure dates in December. The daily bag limit for cottontails is four. There is no mandatory reporting of rabbits harvested during the annual hunting season. Reported harvest of rabbits during the hunting season is based on New Jersey Firearm Harvest Surveys, conducted every other year by the NJDFW. The NJDFW may issue various permits involving lethal removal of rabbits such as Special Wildlife Depredation Permits and Scientific Collecting Permits.

Table 3.2 - Number of eastern cottontails addressed in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Hunter Harvested[2]	Other Entities' Lethal Removal Under State Permits[3]
2011-2012	14	44,451	0
2012-2013	15	No Survey Conducted	0
2013-2014	47	77,993	0
2014-2015	18	No Survey Conducted	0
2015-2016	35	45,821	26
Average	**25.8**	**56,088.3**	**5.2**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year, includes cottontails, hares, and jackrabbits; (NJDFW 2017f)
[3] Data reported by calendar year; (Anthony McBride, NJDFW, personal communication, 2018)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 200 cottontails could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual hunter harvest data and permit take to assess WS's impacts to the rabbit population, WS's removal of 200 rabbits would represent 0.36% of the estimated harvest by hunters and permit holders. This level of removal is insignificant and not expected to negatively impact rabbit populations.

Like many other mammal species in New Jersey, cottontail rabbits maintain sufficient population densities to allow for an annual hunting season. WS's lethal removal would be a limited component of the species overall harvest and lethal removal; therefore, it could be considered of low magnitude when compared to the number of rabbits being harvested and lethally removed in New Jersey.

Coyote Population Impact Analysis

Nearly 400 New Jersey municipalities, which equals 94% of the state's land area, and all 21 counties have reported coyotes (NJDFW 2017d). Coyotes are tolerant of human activities and are extremely adaptable, allowing them to survive and thrive throughout the state (NJDFW 2017d). New Jersey's coyote population was estimated as 3,000 with an increasing trend according to a 2006 article in the New Jersey Fish and Wildlife Digest (McBride 2006). The current population trend for coyotes in New Jersey is increasing.

The number of coyotes lethally removed by WS, hunters, trappers and/or other entities from 2012 to 2016 is shown in Table 3.3. Coyotes are classified as a game, furbearer, and nuisance species in New Jersey with a regulated annual hunting and trapping season. The hunting season runs from mid-September or early October through mid-March and the trapping season runs from mid-November through mid-March; coyotes have no daily or seasonal bag limit. In addition, coyotes may be legally harvested outside of the established season by properly licensed turkey hunters if encountered incidental to legal turkey hunting. It is mandatory that take of coyote be reported to a NJDFW Regional Law Enforcement Office within 24 hours. Harvest of coyotes during the hunting and trapping season is based on information received by the NJDFW through mandatory reporting. In addition to hunting and trapping, coyotes can be lethally removed as a nuisance species by property owners, occupants, and/or their agents when suffering damage. Farmers or their agents may also control coyotes at any time by lawful procedures when found destroying livestock, crops or poultry. The number of coyotes lethally removed as a nuisance species as well those reported killed for other reasons are part of the mandatory reporting system and are included in Table 3.3.

Table 3.3 - Number of coyotes addressed in New Jersey from 2012 to 2016

Year	WS'Lethal Removal[1]	Trapper Harvested[2]	Hunter Harvested[2]	Removal due to Disease[2]	Removal due to Nuisance[2]	Removal due to Motor Vehicle Accident[2]	Removal due to Unknown Reason[2]
2011-2012	2	162	87	0	8	13	1
2012-2013	5	243	56	1	2	22	0
2013-2014	1	194	80	0	7	10	0
2014-2015	0	197	90	1	1	18	1
2015-2016	2	171	92	1	0	13	2
Average	**2**	**193.4**	**81**	**0.6**	**3.6**	**15.2**	**0.8**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (Andrew Burnett, NJDFW, personal communication, 2018)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 50 coyotes could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual hunter and trapper harvest as well as the removal for other reasons, WS's removal of 50 coyotes would represent 16.97% of the estimated take by hunters/trappers and removal for other reasons noted in Table 3.3. When WS's removal of 50 coyotes is compared to the population estimate for coyotes, WS removal would be 1.67%. This level of removal is insignificant and not expected to negatively impact coyote populations.

The unlimited hunter and trapper harvest allowed by the NJDFW during the length of the hunting and trapping seasons provides an indication that cumulative removal, including removal for damage management, would not reach a level where overharvest of the coyote population would occur resulting in an undesired population decline. The annual WS removal would be of low magnitude since coyotes are not considered to be of low density. WS's lethal removal would be a limited component of the species overall harvest and lethal removal. Therefore, WS removal would also be considered of low magnitude when compared to the number of coyotes being harvested and lethally removed in New Jersey.

White-tailed Deer (Wild and Captive) Population Impact Analysis

The 2016 huntable portion of the white-tailed deer population in New Jersey was estimated to be 112,126 deer (Anthony McBride, NJDFW, personal communication, 2018). Deer present in New Jersey's urban areas, where hunting is not feasible, are not surveyed or included in the estimate. Studies in New Jersey suggest an average home range of one square mile or less in Hunterdon County (Burnett 2004) and an average home range of 360 acres in the Pine Barrens (Carole Stanko, NJDFW, personal communication, 2018). White-tailed deer adults typically give birth to twins but reproduction is dependent upon nutrition (Craven and Hygnstrom 1994).

The number of white-tailed deer lethally removed by WS, hunters and/or other entities from 2012 to 2016 is shown in Table 3.4. White-tailed deer are considered a game species in New Jersey.
There are three deer hunting seasons and three permit seasons to offer the opportunity to harvest addition deer in a specific zone. There are 60 management zones with specific bag limits and season dates depending on the goal of the deer management zone. All deer harvested must be reported to the NJDFW's Automated Harvest Reporting System via phone or internet. Removal of deer outside of the hunting season or regulations may occur by farmers who apply for a permit when crop damage is occurring or by entities with an approved CBDMP. This accounted for an additional 2,429 deer on

average being removed annually between 2012 and 2016. Captive deer are found on a property possessing a NJDFW Captive Game Species Permit for deer, which differentiates them from wild deer. In 2018, the NJDFW issued thirty Captive Game Species Permits for white-tailed deer under the categories of wildlife rehabilitation, zoological, propagation and sales, individual hobby, and animal exhibitor/theatrical.

Table 3.4 - Number of white-tailed deer addressed in New Jersey from 2012 to 2016

Year	WS's Lethal Removal (Wild)[1]	WS's Lethal Removal (Captive)[1]	Hunter Harvested[2]	Other Entities' Lethal Removal Under State Permits[3]
2011-2012	15	22	50,109	2,587
2012-2013	33	19	49,942	2,354
2013-2014	25	0	51,595	3,214
2014-2015	14	0	52,704	2,304
2015-2016	41	0	41,439	1,685
Average	**25.6**	**8.2**	**49,157.8**	**2,428.8**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017g)
[3] Data reported by calendar year; (Anthony McBride, NJDFW, personal communication, 2018)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 800 wild white-tailed deer and 400 captive white-tailed deer could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual hunter harvest data and permit holder data to assess WS's impacts to the white-tailed deer population, WS's removal of 1,200 white-tailed deer (800 wild and 400 captive) would represent 2.33% of the estimated harvest by hunters and permit holders. On the other hand, WS's removal of 1,200 white-tailed deer (800 wild and 400 captive) when compared to the 2016 population estimate for white-tailed deer would represent 1.07%. This level of removal is insignificant and not expected to negatively impact white-tailed deer populations.

Like many other mammal species in New Jersey, white-tailed deer maintain sufficient population densities to allow for an annual hunting season. WS's lethal removal would be a limited component of the species overall harvest and lethal removal; therefore, it could be considered of low magnitude when compared to the number of white-tailed being harvested and lethally removed in New Jersey.

Gray Fox Population Impact Analysis

The current gray fox population for New Jersey is unknown; however, the population trend for gray fox in New Jersey is stable. Gray fox are common in New Jersey's deciduous woodlands with a typical home range of 500 acres; unlike the red fox, they are only occasionally seen in agricultural areas (NJDFW 2013b). They can breed at one year and have a litter of 4-6 pups (NJDFW 2013b).

The number of gray fox lethally removed by WS, hunters, trappers and/or other entities from 2012 to 2016 is shown in Table 3.5. Gray fox are classified as a game, furbearer, and nuisance species in New Jersey with a regulated annual hunting season that runs from end of September to mid-March and trapping season that runs mid-November to mid-March. No daily or seasonal bag limit exists for gray fox; furthermore, there is no mandatory reporting of harvested gray fox. Reported harvest of gray fox during the trapping season is based on New Jersey Trapper Harvest Surveys, conducted annually by the NJDFW. Meanwhile, reported harvest during the hunting season is based on New Jersey Firearm Harvest Surveys, conducted every other year by the NJDFW. In addition to hunting and trapping, gray fox can be lethally removed as a nuisance species by property owners and occupants of dwellings (or by their designated agents) when suffering damage. Farmers or their agents are also allowed to remove gray fox

at any time when found destroying livestock, crops, or poultry. The total number of gray fox lethally removed as a nuisance species in New Jersey by these entities is unknown. The NJDFW may issue various permits involving lethal removal of gray fox such as Special Wildlife Depredation Permits and Scientific Collecting Permits.

Table 3.5 - Number of gray fox addressed in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Trapper Harvested[2]	Hunter Harvested
2011-2012	0	105	0 [3]
2012-2013	0	164	No Survey Conducted
2013-2014	0	234	664 [4]
2014-2015	0	181	No Survey Conducted
2015-2016	2	200	358 [5]
Average	**0.4**	**176.8**	**340.7**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017f)
[3] Data reported by state fiscal year; (NJDFW 2012a)
[4] Data reported by state fiscal year; (NJDFW 2014a)
[5] Data reported by state fiscal year; (Burnett 2016)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 50 gray fox could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual trapper/hunter harvest data to assess WS's impacts to the gray fox population, WS's removal of 50 gray fox would represent 9.66% of the estimated harvest by hunters and trappers. This percentage would be further reduced if data for all lethal removal was available including nuisance removal by property owners and farmers. This level of removal is insignificant and not expected to negatively impact gray fox populations.

The unlimited hunter/trapper harvest allowed by the NJDFW during the length of the hunting and trapping seasons provides an indication that cumulative removal, including removal for damage management, would not reach a level where harvest of the gray fox population would result in an undesired population decline. WS's lethal removal would be a limited component of the species overall harvest and lethal removal. Therefore, WS removal would also be considered of low magnitude when compared to the number of gray fox being harvested and lethally removed in New Jersey.

Red Fox Population Impact Analysis

The current red fox population for New Jersey is unknown; however, the population trend for red fox in New Jersey is stable. Red fox litters vary from one to as many as fourteen pups, with an average of five; in addition, both males and females are sexually mature at 10 months old (NJDFW 2014c). Their home range is between 2 and 7.5 square miles, depending on the quality of habitat (NJDFW 2014c).

The number of red fox lethally removed by WS, hunters, trappers and/or other entities from 2012 to 2016 is shown in Table 3.6. Like the gray fox, red fox are classified as a game, furbearer, and nuisance species in New Jersey. Both species of fox have identical hunting/trapping seasons and regulations. The hunting season runs from the end of September to mid-March, and the trapping season runs from mid-November to mid-March. No daily or seasonal bag limit exists for red fox; furthermore, there is no mandatory reporting of harvested red fox. Reported harvest of red fox during the trapping season is based on New Jersey Trapper Harvest Surveys, conducted annually by the NJDFW. Meanwhile, reported harvest during the hunting season is based on New Jersey Firearm Harvest Surveys, conducted every other year by the NJDFW. In addition to hunting and trapping, red fox can be lethally removed as a nuisance species by

property owners and occupants of dwellings (or by their designated agents) when suffering damage. Farmers or their agents are also allowed to remove red fox at any time when found destroying livestock, crops, or poultry. The total number of red fox lethally removed as a nuisance species in New Jersey by these entities is unknown. The NJDFW may issue various permits involving lethal removal of red fox such as Special Wildlife Depredation Permits and Scientific Collecting Permits.

Table 3.6 - Number of red fox addressed in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Trapper Harvested[2]	Hunter Harvested
2011-2012	6	5,293	1,527 [3]
2012-2013	3	5,967	No Survey Conducted
2013-2014	12	6,871	2,352 [4]
2014-2015	42	9,068	No Survey Conducted
2015-2016	33	8,691	6,348 [5]
Average	**19.2**	**7,178**	**3,409**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017f)
[3] Data reported by state fiscal year; (NJDFW 2012a)
[4] Data reported by state fiscal year; (NJDFW 2014a)
[5] Data reported by state fiscal year; (Burnett 2016)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 100 red fox could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual trapper/hunter harvest data to assess WS's impacts to the red fox population, WS's removal of 100 red fox would represent 0.94% of the estimated harvest by hunters and trappers. This percentage would be even lower if data for all lethal removal was available including nuisance removal by property owners and farmers. This level of removal is not expected to negatively impact red fox populations.

The unlimited hunter/trapper harvest allowed by the NJDFW during the length of the hunting and trapping seasons provides an indication that cumulative removal, including removal for damage management, would not reach a level where overharvest of the red fox population would occur resulting in an undesired population decline. WS's lethal removal would be a limited component of the species overall harvest and lethal removal; therefore, it could be considered of low magnitude when compared to the number of red fox being harvested and lethally removed in New Jersey.

Muskrat Population Impact Analysis

The current muskrat population for New Jersey is unknown; however, the population trend for muskrats in New Jersey is stable. Muskrats are most successful in brackish marsh habitats in New Jersey; however, they occupy a wide number estuarine habitats within the state, including tidal and inland marshes as well as freshwater ponds and streams (NJDFW 2012b). They reproduce at one year and commonly have two to three litters a year in New Jersey (NJDFW 2012b). The muskrats' home range is approximately 200 feet, yet they spend about half of their time within 50 feet of their lodge or den (Burnett 2015).

The number of muskrats lethally removed by WS, trappers and/or other entities from 2012 to 2016 is shown in Table 3.7. Muskrats are classified as a furbearer species with a regulated annual trapping season from November or December through mid-March; muskrats have no daily or seasonal bag limit for trapping. There is no mandatory reporting of muskrats harvested during the annual trapping season. Reported harvest of muskrats during the trapping season is based on New Jersey Trapper Harvest Surveys, conducted annually by the NJDFW. Muskrat removal to alleviate damage outside of the

trapping season requires a Special Wildlife Depredation Permit issued by the NJDFW. Between 2012 and 2016, the NJDFW issued permits to other entities for muskrat removal; however, no muskrats were taken under these permits.

Table 3.7 - Number of muskrats addressed in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Trapper Harvested[2]	Other Entities' Lethal Removal Under State Permits[3]
2011-2012	55	44,599	0
2012-2013	11	21,229	0
2013-2014	0	26,071	0
2014-2015	0	17,098	0
2015-2016	0	17,298	0
Average	**13.2**	**25,259**	**0**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017e)
[3] Data reported by calendar year; (Anthony McBride, NJDFW, personal communication, 2018)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 200 muskrats could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual trapper harvest data and permit take to assess WS's impacts to the muskrat population, WS's removal of 200 muskrats would represent 0.79% of the estimated harvest by trappers and permit holders. This level of removal is insignificant and not expected to negatively impact muskrat populations.

The unlimited trapper harvest allowed by the NJDFW during the length of the trapping seasons provides an indication that cumulative removal, including removal for damage management, would not reach a level where overharvest of the muskrat population would occur resulting in an undesired population decline. WS's lethal removal would be a limited component of the species overall harvest and lethal removal; therefore, it could be considered of low magnitude when compared to the number of muskrats being harvested and lethally removed in New Jersey.

Nutria Population Impact Analysis

At this time, there is no known nutria population in New Jersey. However, nutria are found in other mid-Atlantic states and are a non-native species. The nutria's original range was south of the equator in South America (LeBlanc 1994). However, due to accidental and intentional releases, nutria are now found throughout most of the United States in either widespread or localized populations (LeBlanc 1994). In New Jersey, two nutria were captured in the mid-1980s along the Delaware River near Trenton, but no nutria have since been reported either anecdotally or through the annual trapper harvest survey (Andrew Burnett, NJDFW, personal communication, 2018). Nutria can breed year-round in most of their current range, have litters averaging 4-5, and reach sexually maturity at four months of age in optimum conditions (LeBlanc 1994).

Nutria are classified as a furbearer species with a regulated annual trapping season from November or December through mid-March; there is no daily or seasonal bag limit for trapping nutria. Harvest of nutria is required to be reported to the NJDFW. No nutria were removed by WS, trappers or other entities during FY 2012 – FY 2016 or CY 2012- CY 2016.

Direct, Indirect, and Cumulative Effects:
Based on the potential for nutria expansion into New Jersey and in anticipation of requests for assistance, WS could lethally remove up to 200 nutria annually under the proposed action / no action alternative to manage damage or threats of damage.

Nutria, which are a non-native species, are considered by many wildlife biologists to be an undesirable component of North American wild and native ecosystems. Given the invasive status of nutria, any reduction in populations, or even the complete removal of populations, could be considered beneficial to the environment. Additionally, executive Order 13112 directs federal agencies to use their programs and authorities to prevent the spread of and control populations of invasive species that cause economic or environmental harm, or harm to human health.

Opossum Population Impact Analysis

The current opossum population for New Jersey is unknown; however, the population trend for opossum in New Jersey is stable. Opossums have a home range of 10 to 50 acres and can have two litter a year, containing seven young each (Jackson 1994).

The number of opossums lethally removed by WS, hunters, trappers and/or other entities from 2012 to 2016 is shown in Table 3.8. Opossums are classified as a game, furbearer, and nuisance species in New Jersey with a regulated annual hunting and trapping season. The hunting season runs from October through early March and the trapping season runs from mid-November through mid-March; opossums have no daily or seasonal bag limit. There is no mandatory reporting of opossums harvested during the annual hunting/trapping seasons. Reported harvest of opossums during the trapping season is based on New Jersey Trapper Harvest Surveys, conducted annually by the NJDFW. Meanwhile, reported harvest during the hunting season is based on New Jersey Firearm Harvest Surveys, conducted every other year by the NJDFW. In addition to hunting and trapping, opossums can be lethally removed as a nuisance species by property owners and occupants of dwellings (or by their designated agents) when suffering damage. Farmers or their agents are also allowed to remove opossums at any time when found destroying livestock, crops, or poultry. The total number of opossums lethally removed as a nuisance species by these entities is unknown. The NJDFW may issue various permits involving lethal removal of opossums such as Special Wildlife Depredation Permits and Scientific Collecting Permits.

Table 3.8 - Number of opossums harvested in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Trapper Harvested[2]	Hunter Harvested[3]
2011-2012	23	932	517
2012-2013	7	1,121	No Survey Conducted
2013-2014	3	1,124	178
2014-2015	2	1,148	No Survey Conducted
2015-2016	19	355	564
Average	**10.8**	**936**	**419.7**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017e)
[3] Data reported by state fiscal year; (NJDFW 2017f)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 200 opossums could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual trapper/hunter harvest data to assess WS's impacts to the opossum population, WS's removal of 200 opossums would represent 14.75% of the estimated harvest by hunters

and trappers. This percentage would be further reduced if data for all lethal removal was available including nuisance removal by property owners and farmers. This level of removal is insignificant and not expected to negatively impact opossum populations.

The unlimited hunter/trapper harvest allowed by the NJDFW during the length of the hunting and trapping seasons provides an indication that cumulative removal, including removal for damage management, would not reach a level where overharvest of the opossum population would occur resulting in an undesired population decline. The annual WS removal would be of low magnitude since opossums are not considered to be of low density. WS's lethal removal would be a limited component of the species overall harvest and lethal removal. Therefore, WS removal would also be considered of low magnitude when compared to the number of opossums being harvested and lethally removed in New Jersey.

Raccoon Population Impact Analysis

The raccoon is found in every county within New Jersey including the most urban areas; it is hard to describe a habitat that the raccoon does not inhabit (NJDFW 2013a). The major causes of death for raccoons in New Jersey are motor vehicle collisions, disease, predation and trapping/hunting. When trapping and hunting declines, mortality from the other causes increases; for example, disease is most common in raccoons in over-crowded habitats such as residential areas and parks (NJDFW 2013a). The current raccoon population for New Jersey is unknown; however, the population trend for raccoons in New Jersey is stable.

The number of raccoons lethally removed by WS, hunters, trappers and/or other entities from 2012 to 2016 is shown in Table 3.9. Raccoons are classified as a game, furbearer, and nuisance species in New Jersey with a regulated annual hunting and trapping season. The hunting season runs from October through March and the trapping season runs from mid-November through mid-March; raccoons have no daily or seasonal bag limit (NJDFW 2015b). There is no mandatory reporting of raccoons harvested during the annual hunting/trapping seasons. Reported harvest of raccoons during the trapping season is based on New Jersey Trapper Harvest Surveys, conducted annually by the NJDFW. Meanwhile, reported harvest during the hunting season is based on New Jersey Firearm Harvest Surveys, conducted every other year by the NJDFW. In addition to hunting and trapping, raccoons can be lethally removed as a nuisance species by property owners, occupants, and/or their agents when suffering damage. Farmers or their agents may also control raccoons at any time by lawful procedures when found destroying livestock, crops or poultry. The total number of raccoons lethally removed as a nuisance species in New Jersey by these entities is unknown. The NJDFW may issue various permits involving lethal removal of raccoons such as Special Wildlife Depredation Permits and Scientific Collecting Permits.

Table 3.9 - Number of raccoons harvested in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Trapper Harvested[2]	Hunter Harvested[3]
2011-2012	20	7,943	1,588
2012-2013	12	6,231	No Survey Conducted
2013-2014	18	9,647	1,968
2014-2015	25	7,096	No Survey Conducted
2015-2016	63	12,488	8,568
Average	**27.6**	**8,681**	**4,041.3**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017e)
[3] Data reported by state fiscal year; (NJDFW 2017f)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 300 raccoons could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual trapper/hunter harvest data to assess WS's impacts to the raccoon population, WS's removal of 300 raccoons would represent 2.36% of the estimated harvest by hunters and trappers. This percentage would be further reduced if data for all lethal removal was available including nuisance removal by property owners and farmers. This level of removal is insignificant and not expected to negatively impact raccoon populations.

The unlimited hunter/trapper harvest allowed by the NJDFW during the length of the hunting and trapping seasons provides an indication that cumulative removal, including removal for damage management, would not reach a level where overharvest of the raccoon population would occur resulting in an undesired population decline. WS's lethal removal would be a limited component of the species overall harvest and lethal removal; therefore, it could be considered of low magnitude when compared to the number of raccoons being harvested and lethally removed in New Jersey.

Striped Skunk Population Impact Analysis

The current striped skunk population for New Jersey is unknown; however, the population trend for striped skunks in New Jersey is stable. The striped skunk is found throughout New Jersey with home ranges of 0.4 to 1.5 square miles in rural areas and 0.25 square miles in urban environments, due to the greater availability of food and dens (NJDFW 2012c). They typically produce one litter a year comprised of 5-6 kits (NJDFW 2012c).

The number of striped skunks lethally removed by WS, hunters, trappers and/or other entities from 2012 to 2016 is shown in Table 3.10. Skunks are classified as a game, furbearer, and nuisance species in New Jersey. The hunting seasons lasts from early October to early March with an unlimited bag limit. The trapping season also includes an unlimited bag limit and runs from mid-November to mid-March. There is no mandatory reporting of skunks harvested during the annual hunting/trapping seasons. Reported harvest of skunks during the trapping season is based on New Jersey Trapper Harvest Surveys, conducted annually by the NJDFW. Harvest during the hunting season is typically based on New Jersey Firearm Harvest Surveys, conducted every other year by the NJDFW. However, this survey does not take into account skunk harvest, and there is no other method for tracking the number of skunks hunted in New Jersey. In addition to hunting and trapping, skunks can be lethally removed as a nuisance species by property owners, occupants, and/or their agents when suffering damage. Farmers or their agents may also control skunks at any time by lawful procedures when found destroying livestock, crops or poultry. The total number of raccoons lethally removed as a nuisance species in New Jersey by these entities is unknown. The NJDFW may issue various permits involving lethal removal of raccoons such as Special Wildlife Depredation Permits and Scientific Collecting Permits.

Table 3.10 - Number of striped skunks addressed in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Trapper Harvested[2]
2011-2012	8	297
2012-2013	2	295
2013-2014	4	270
2014-2015	7	248
2015-2016	15	203
Average	**7.2**	**262.6**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017e)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 100 striped skunks could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual trapper harvest data to assess WS's impacts to the skunk population, WS's removal of 100 striped skunks would represent 38.08% of the estimated harvest by trappers. This percentage would be further reduced if data for all lethal removal was available including nuisance removal by property owners and farmers. This level of removal is insignificant and not expected to negatively impact stripped skunk populations.

The unlimited hunter/trapper harvest allowed by the NJDFW during the length of the hunting and trapping seasons provides an indication that cumulative removal, including removal for damage management, would not reach a level where overharvest of the skunk population would occur resulting in an undesired population decline. The annual WS removal would be of low magnitude since skunks are not considered to be of low density. WS's lethal removal would be a limited component of the species overall harvest and lethal removal. Therefore, WS removal would also be considered of low magnitude when compared to the number of skunks being harvested and lethally removed in New Jersey.

Feral Swine Population Impact Analysis

Feral swine (also known as feral hogs, feral pigs, wild boar, and wild pigs) are not native to the United States. They have evolved from swine introduced to Florida by Spanish explorers, from domestic swine that have escaped from farms, and/or from true Eurasian wild boars released by hunters (Mayer and Brisbin 2008). The presence of feral swine in New Jersey was documented by NJDEP in 2004 within Gloucester County (NJDA n.d.). Feral swine populations have the potential to double in size within four months due to having litter sizes of 4-12 piglets, producing up to two litters per year, breeding year-round, and becoming sexually mature at 6-8 months of age (Mayer and Brisbin 2008).

USDA, APHIS received funding from Congress, beginning in FY 2014, to implement a collaborative, national feral swine damage management program led by the WS program. Under this national approach, New Jersey had a Level 1 status. Level 1 status is defined as programs known to have a small population of feral swine or have had reports of sightings of feral swine that warrant further investigation (USDA 2018). In FY 2017, New Jersey was lowered to a detection status. This occurs when WS and state partners determine that all known populations of feral swine have been removed; the status remains in effect for a minimum of two years to allow for continued monitoring of feral swine (USDA 2018).

The number of feral swine lethally removed by WS, hunters, and/or other entities from 2012 to 2016 is shown in Table 3.11. Feral swine are considered a hazardous, invasive species in New Jersey. Within the Gloucester County area, deer hunters in Management Zones 25 and 65, who have not reached their deer limit, are allowed to hunt feral swine during the regular deer seasons. All feral swine are required to be checked with the NJDFW. It is also heavily advertised for hunter and other individuals to report feral swine sightings, rooting evidence, or other damage. No hunters checked-in harvested feral swine during the 2011-2012 through 2015-2016 hunting seasons. WS removed an average of 0.8 feral swine annually between FY 2012 and FY 2016.

Table 3.11 - Number of feral swine harvested in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Hunter Harvested[2]
2011-2012	1	0
2012-2013	0	0
2013-2014	2	0
2014-2015	1	0
2015-2016	0	0
Average	**0.8**	**0**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (Andrew Burnett, NJDFW, personal communication, 2018)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance by WS and anticipated future requests, WS could lethally remove an unlimited number of feral swine annually under the proposed action / no action alternative to manage damage or threats of damage.

Feral swine are considered by many wildlife biologists to be an undesirable component of North American wild and native ecosystems. Given the invasive status of feral swine, any reduction in populations, or even the complete removal of populations, could be considered beneficial to the environment. Additionally, executive Order 13112 directs federal agencies to use their programs and authorities to prevent the spread of and control populations of invasive species that cause economic or environmental harm, or harm to human health. WS activities involving feral swine removal are coordinated with the state through a Special Wildlife Management Permit issued by the NJDFW. WS's lethal removal of feral swine under state permits would be reported annually to the NJDFW.

Woodchuck Population Impact Analysis

The current woodchuck population for New Jersey is unknown; however, the population trend for woodchucks in New Jersey is stable. Woodchucks, also known as groundhogs, produce a single litter each year with 2-6 young (Bollengier 1994). In addition, woodchucks occupy a small area - typically wandering only 50-150 feet from their dens (Bollengier 1994).

The number of woodchucks lethally removed by WS, hunters and/or other entities from 2012 to 2016 is shown in Table 3.12. Woodchucks are considered both a game and nuisance species in New Jersey. The hunting season, which has an unlimited bag limit, begins in March and concluded in late September. There is no mandatory reporting of woodchucks harvested during the annual hunting season. Reported harvest of woodchucks during the hunting season is based on New Jersey Firearm Harvest Surveys, conducted every other year by the NJDFW. In addition to hunting, woodchucks can be lethally removed as a nuisance species by property owners, occupants, and/or their agents when suffering damage. Farmers or their agents may also control woodchucks at any time by lawful procedures when found destroying livestock, crops or poultry. The total number of woodchucks lethally removed as a nuisance species in New Jersey by these entities is unknown. The NJDFW may issue various permits involving lethal removal of woodchucks such as Special Wildlife Depredation Permits and Scientific Collecting Permits.

Table 3.12 - Number of woodchucks harvested in New Jersey from 2012 to 2016

Year	WS's Lethal Removal[1]	Hunter Harvested[2]
2011-2012	22	16,447
2012-2013	30	No Survey Conducted
2013-2014	67	44,869
2014-2015	166	No Survey Conducted
2015-2016	84	49,849
Average	**73.8**	**37,055**

[1] Data reported by federal fiscal year
[2] Data reported by state fiscal year; (NJDFW 2017f)

Direct, Indirect, and Cumulative Effects:
Based on previous requests for assistance received by WS and anticipated increase of future requests, up to 300 woodchucks could be lethally removed annually by WS to alleviate damage and protect human health and safety. Using the average annual hunter harvest data to assess WS's impacts to the woodchuck population, WS's removal of 300 woodchucks would represent 0.81% of the estimated harvest by hunters. This percentage would be even lower if data for all lethal removal was available including nuisance removal by property owners and farmers. This level of removal is insignificant and not expected to negatively impact woodchuck populations.

The unlimited hunter harvest allowed by the NJDFW during the length of the hunting season provides an indication that cumulative removal, including removal for damage management, would not reach a level where overharvest of the woodchuck population would occur resulting in an undesired population decline. WS's lethal removal would be a limited component of the species overall harvest and lethal removal; therefore, it could be considered of low magnitude when compared to the number of woodchucks being harvested and lethally removed in New Jersey.

Black Bear Population Impact Analysis

New Jersey's current bear population is estimated at 2,500 (NJDFW 2018). Black bear sightings have been confirmed in all 21 counties, with excellent core habitat found primarily in Sussex, Passaic, Warren and Morris counties (NJDFW 2017b). Female black bears in New Jersey typically have a home range of less than two square miles while the male's home range is larger and may overlap those of multiple females (NJDFW 2017b). The NJDFW (2018) Status Report states "that northwestern NJ continues to have one of the densest black bear populations in the country and one of its most productive." The report further describes the high reproductive potential of New Jersey black bears as having average litter sizes of 2.7, reproducing at 2-3 years, and a cub survivorship of 70%.

Black bears are considered a game species in New Jersey. Hunting seasons for black bear in New Jersey were established in 2003, 2005, and 2010-2017. In the past when hunting was removed from New Jersey's integrated management, both the black bear population and complaints increased despite the fact that the nonlethal components were intensively used (NJDFW 2018). In fact, it is predicted that the current bear population will potentially double in five years if the regulated hunt was eliminated, based on data from 2006 to 2010 when no hunting season was implemented (NJDFW 2018). In 2017, 409 black bears were taken during the regulated hunting season and an additional three bears were euthanized for agricultural damage (NJDFW 2018). WS has not lethally removed any black bears.

Direct, Indirect, and Cumulative Effects:
WS would only use nonlethal techniques on black bears, and the management area would be limited to airports and airfields. Nonlethal methods would target single animals whose presence was causing a conflict with human health and safety. Aversive conditioning of nuisance bears is part of many bear management plans including the State's Comprehensive Black Bear Management Policy. Harassment of black bears by WS would have no significant effects on the local or statewide population of black bears.

Cat and Dog Population Analysis

The number of feral and free ranging cats in New Jersey is unknown. Free-ranging cats and dogs are animals socialized to humans but can be strays, lost or abandoned pets, or pets with homes that are allowed to roam outside. Feral cat and dogs, in contrast, are not socialized to humans and are traditionally not kept as pets. The average number of stray animals impounded annually in NJ is 82,563 (Table 3.13).

WS would only use nonlethal methods to address requests for assistance with cats and dogs. Feral or free-ranging cats and dogs captured by WS intentionally or unintentionally will be transferred to an animal pound/shelter or local animal control officer (WS New Jersey Policy on Feral, Free-ranging, and Hybrid Dog Damage Management). Free-ranging and feral cats and dogs are addressed at the local level by animal control officers.

WS personnel are trained and experienced in the identification of damage, the identification of animals responsible for the damage, the identification of individual animals, and the selection and implementation of methods which are as species specific as possible. Management actions are directed towards specific animals or groups of animals responsible for causing damage or posing threats. During FY 2012 – FY 2016, WS transferred an average of 6.4 cats and 0.4 dogs annually to pounds/shelters.

Table 3.13 - Number of feral/free-ranging cats and dogs captured or transferred to NJDOH in New Jersey from 2012 to 2016

Year	Feral/Free-Ranging Cats Captured by WS[1,2]		Feral/Free-Ranging Dogs Captured by WS[1,2]		NJDOH Stray Animal Intake and Disposition Survey[3]	
	Transferred custody	Lethal removal	Transferred custody	Lethal removal	Impounded	Euthanized
2012	2	0	1	0	88,594	26,710
2013	5	0	0	0	82,902	23,490
2014	5	0	0	0	80,346	21,076
2015	5 (1)	(1)	1	0	78,861	16,816
2016	13 (1)	0	0	0	82,116	15,340
AVERAGE	**6.4**	**0.2**	**0.4**	**0**	**82,563.8**	**20,686.4**

[1] Data reported by federal fiscal year
[2] # of dogs/cats addressed intentionally; (#) of cats addressed unintentionally
[3] Data reported by CY; (NJDOH 2017b)

Direct, Indirect, and Cumulative Effects:
Control efforts by WS would typically be limited to live-trapping, primarily using cage traps, with subsequent transport and transfer of custody to a licensed animal pound/shelter. After relinquishing the feral or free-roaming cats/dogs to an animal pound/shelter, the care and the final disposition of the cat/dog would be the responsibility of the animal pound/shelter. Feral or free-roaming cats/dogs would be removed in projects aimed at protecting human safety and alleviating damage or threats of damage to

agricultural resources, property, and natural resources including T&E species. The transfer of custody of up to 100 cats and 25 dogs annually by WS would have no significant adverse effects on local or statewide populations of these species in New Jersey.

Small Mammal (Insectivore and Rodent) Population Impact Analysis

Two categories of insectivores (shrews and moles) and several categories of small rodents (i.e. mice, rats, and voles) can be found in New Jersey. The three species of small rodents found in New Jersey which are not native to North America are Norway rats, black rats and house mice. Both insectivores and small rodents are prolific breeders.

Shrews, moles, mice, rats and voles may be lethally removed by WS during wildlife hazard management, assessment, and monitoring at airports and airbases because these species serve as attractants to raptors and mammalian carnivores, leading to a direct hazard to aircrafts. A Scientific Collecting Permit issued by the NJDFW would be required for removal of native insectivores and small rodents, while removal of non-native species would not require a permit.

New Jersey's small mammal populations listed in next paragraph have either a stable, unknown, or introduced status. From FY 2012 to FY 2016, WS lethally removed 51 mice (deer and house), 74 Norway rats, and 10 voles. All WS removal was during operational activities conducted at airports/airfields. The total number of small mammals removed by other entities in New Jersey is unknown.

Direct, Indirect, and Cumulative Effects:
Removal of these species by WS would be done at specific isolated sites (airports and airfields). The primary method of lethal removal for these species by WS would be trapping or toxicants. WS could lethally remove 25 black rat (*Rattus rattus*), 300 Norway rat (*Rattus norvegicus*), and a cumulative total of 500 of the following species, none of which are listed as threatened or endangered: least shrew (*Cryptotis parva*), short-tailed shrew (*Blarina brevicauda*), masked shrew (*Sorex cinereus)*, long-tailed shrew (*Sorex dispar*), smokey shrew (*Sorex fumeus*), Tuckahoe masked shrew (*Sorex cinereus nigriculus*), water shrew (*Sorex palustris*), eastern mole (*Scalopus aquaticus*), star-nosed mole (*Condylura cristata*), white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), house mouse (*Mus musculus*), red-backed vole (*Clethrionomys gapperi*), woodland jumping mouse (*Napaeozapus insignis*), meadow jumping mouse (*Zapus hudsonius*), meadow vole (*Microtus pennsylvanicus*), and pine vole (*Microtus pinetorum*). Since species composition and numbers removed from airports and airfields varies each year, it is hard to predict a specific species' anticipated removal. However, WS's annual removal per species would be within the permit limits set by the NJDFW. Due to their high reproductive rates and because management activities would be localized to airports and airfields, the lethal removal of small mammals annually to manage damage or threats is not expected to have any significant adverse impact on small mammal populations. Norway rats, black rats and house mice are non-native species, are not afforded any protection, and are considered by many wildlife biologists to be an undesirable component of North American wild and native ecosystems. Given the invasive status of Norway rats, black rats and house mice, any reduction in their populations, or even the complete removal of populations, could be considered beneficial to the environment. Executive Order 13112 directs federal agencies to use their programs and authorities to prevent the spread of and control populations of invasive species that cause economic or environmental harm, or harm to human health.

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. Under the

proposed action, WS could lethally remove up to 25 individuals each of the following species annually: eastern gray squirrel, red squirrel, mink, river otter, and porcupine. The status of these species in New Jersey is either stable or increasing. The removal of 25 individuals would not significantly impact the populations for any of these species as this level of removal is of considerably low magnitude. 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.

Wildlife Disease Surveillance and Monitoring

In order to detect or monitor for diseases, WS could sample mammals captured live by WS or other entities, mammals that were sick or dying, or mammals lethally removed by hunters, WS or other entities. The sampling (e.g., drawing blood, swabbing nasal cavities, collecting fecal samples) and the subsequent release of live-captured mammals would not result in adverse effects to mammal populations since those mammals would be released unharmed on site. Additionally, the sampling of mammals that were sick, dying, or lethally removed would not result in the additive lethal removal of mammals that would not have already occurred in the absence of a disease sampling program. Therefore, the sampling of mammals for disease as described above would not adversely affect the populations of any of the mammals addressed in this EA.

Alternative 2 – WS Would Address Mammal Damage Using Technical Assistance Only

Under this alternative, WS would provide those persons requesting assistance with managing damage and threats associated with mammals with technical assistance only. Despite no direct involvement by WS in resolving damage and threats, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Appendix D contains a thorough discussion of the methods available for use in managing damage and threats associated with mammals. All methods listed in Appendix D would be available under this alternative although not all methods would be available for direct implementation by all persons.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent damage as permitted by federal, state, and local laws and regulations or those persons could take no action. Therefore, mammal populations in the state would not be directly impacted by WS from a program implementing technical assistance only.

Direct, Indirect, and Cumulative Effects:
The number of mammals lethally removed under this alternative would likely be similar to the other alternatives. Those animals removed under Alternative 1 could be lethally removed with methods described in Appendix D by other entities under this alternative. Lethal removal of those species addressed in this EA can occur, depending upon the species, either through permits issued by the NJDFW, during regulated hunting and trapping seasons, or without a permit as allowed in certain damage and nuisance situations by state laws and regulations.

With the oversight of the NJDFW, it is unlikely that mammal populations would be significantly impacted, directly or cumulatively, by the implementation of this alternative. Management actions could be undertaken by a property owner or manager, provided by private nuisance wildlife control agents, provided by volunteer services of private individuals or organizations, or provided by other entities such as the NJDFW. If direct operational assistance is not provided by WS or other entities, it is

hypothetically possible that frustration caused by the inability to reduce damage and threats could lead to the inappropriate use of legal methods or the use of illegal methods which could lead to unnecessary killing of wildlife. In the past, people have resorted to the illegal use of chemicals and methods to alleviate wildlife damage issues (White et al. 1989; USFWS 2001; FDA 2003).

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not conduct technical or direct operational assistance to reduce threats or alleviate damage associated with mammals. WS would not be involved with any aspect of managing damage associated with mammals. All requests for assistance received by WS to resolve damage caused by mammals would be referred to the NJDFW, the NJDA, local law enforcement or animal control authorities and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Similar to Alternative 2, all methods listed in Appendix D would be available under this alternative although not all methods would be available for direct implementation by all persons.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

Direct, Indirect, and Cumulative Effects:
Lethal removal of those species addressed in this EA could continue to occur since, depending on the species, lethal removal can occur either through permits issued by the NJDFW, during regulated hunting and trapping seasons, or without a permit as allowed in certain damage and nuisance situations by state laws and regulations. The number of mammals lethally removed under this alternative and any direct or cumulative population impacts would likely be similar to the other alternatives. It is not expected that lethal removal would reach a level of significant direct or cumulative impacts to target wildlife populations for the reasons presented in the population impact analysis under Alternative 1.

Management actions could be undertaken by a property owner or manager, provided by private nuisance wildlife control agents, provided by volunteer services of private individuals or organizations, or provided by other entities such as the NJDFW. If direct operational assistance and technical assistance is not provided by WS or other entities, it is possible that a lack of technical knowledge could lead to misidentification and targeting of wrong mammal(s) responsible for damage. It is also possible that frustration caused by the inability to reduce damage and threats, along with ignorance on how best to reduce damage and threats, could lead to the inappropriate use of legal methods and the use of illegal methods. Illegal, unsafe, and environmentally unfriendly actions could lead to unnecessary killing of wildlife. In the past, people have resorted to the illegal use of chemicals and methods to alleviate wildlife damage issues (White et al. 1989; USFWS 2001; FDA 2003).

Issue 2 - Effects of Damage Management Activities on Nontarget Wildlife Species Populations, Including T&E Species

As discussed previously, a concern is often raised about the potential impacts to nontarget animal populations, including T&E species, from the use of methods to resolve damage associated with mammals. The potential effects are analyzed below.

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

The potential for adverse effects to nontargets occurs from the employment of methods to address mammal damage. Under the proposed action/no action alternative, WS could provide both technical assistance and direct operational assistance to those requesting assistance.

WS personnel are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding nontarget species. To reduce the likelihood of capturing nontarget 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 would determine placement of methods to avoid exposure to nontargets. Management actions are directed towards specific animals or groups of animals responsible for causing damage or posing threats. WS consults with the USFWS and the NJDFW to determine the potential risks to federally and state listed T&E species in accordance with the ESA and state laws. Nonlethal methods are given priority when addressing requests for assistance (WS Directive 2.101). Nontarget animals captured in traps are released unless it is determined that the animal would not survive and or that the animal cannot be safely released. WS would only employ methods in response to a request for assistance after the property owner or manager has signed a document agreeing to allow specific methods be used on property they own and/or manage. SOPs to prevent and reduce any potential adverse impacts on nontargets are discussed in Chapter 2. Despite the best efforts to minimize nontarget lethal removal during program activities, the potential for adverse impacts to nontargets exists when applying both nonlethal and lethal methods to manage damage or reduce threats to safety.

Nonlethal Methods

Nonlethal methods have the potential to cause adverse effects to nontargets primarily though physical exclusion, frightening devices or deterrents (see Appendix D). Any exclusionary device erected to prevent access to resources could also potentially exclude nontarget species, therefore adversely impacting that species. The use of frightening devices or deterrents may also disperse nontarget species from the immediate area where they are employed.

Other nonlethal methods available for use under any of the alternatives are live-capture traps (see Appendix D). WS would use and recommend the use of target-specific attractants and place them or recommend they be placed in areas where target species are active to reduce the risk of capturing nontargets. WS would monitor or recommend traps be monitored frequently so nontarget species can be released unharmed.

Eagles may occur in or near areas where damage management activities are conducted. Routine activities conducted by WS' personnel under the proposed action/no action alternative could occur in areas where eagles are present, which could disrupt the current behavior of an eagle or eagles that are nearby during those activities. As discussed previously, "take" as defined by the Bald and Golden Eagle Protection Act, includes 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/no 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 take of 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 (e.g. unintentional disturbance of an eagle). Activities, such as walking to a site, discharging a firearm, riding an ATV or driving a boat, generally represent short-term disturbances to sites where those activities take place. WS would conduct activities that are located near eagle nests using the National Bald Eagle Management Guidelines (USFWS 2007). The categories that 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 eagles.

Lethal Methods

As previously mentioned, eagles may occur in or near areas where management activities are conducted under the proposed action/no action alternative. Non-purposeful lethal removal of a bald or golden eagle or their nests is considered a "take" as defined by the Bald and Golden Eagle Protection Act. WS has reviewed those methods available under the proposed action / no action alternative and the use patterns of those methods. WS determined that the SOPs that WS uses while conducting damage management activities reduces the likelihood that eagles would be lethally removed (e.g., prohibiting placement of a snare within 50 feet of a carcass which may attract eagles).

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage caused by target mammals. All of the lethal methods listed in Appendix D could be available under this alternative although not all methods would be available for direct implementation by all persons. Some of these methods include:

Shooting - In cases where shooting was selected as an appropriate method, identification of an individual target would occur prior to application, eliminating risks to nontargets. 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.

Euthanasia - Nontarget species captured during the implementation of nonlethal capture methods can usually be released prior to euthanasia which occurs subsequent to live-capture.

Snare (cable device) - WS would use snares in compliance with applicable federal, state and local laws and regulations (WS Directive 2.210) as well as WS Directives to minimize risks to nontargets.

Bodygrip Trap (e.g., Conibear) - WS would use bodygrip traps in compliance with applicable federal, state and local laws and regulations (WS Directive 2.210) as well as WS Directives to minimize risks to nontargets.

Rodenticides - A common concern regarding the use of rodenticides is the potential risk to nontarget animals, including T&E species. Rodenticides would be used by WS in accordance with their label and WS Directive 2.401 to minimize risks to nontargets.

Direct, Indirect, and Cumulative Effects:
The persistent use of nonlethal methods would likely result in the dispersal or abandonment of those areas by both target and nontarget species. Therefore, any use of nonlethal methods has similar results on both nontarget and target species. However, the potential impacts to nontargets, like the impacts to target species, are expected to be temporary. WS would not employ or recommend these methods be employed over large geographic areas or at such intensity that essential resources would be unavailable and that long term adverse impacts to nontarget populations would occur. Nonlethal methods are generally regarded has having minimal impacts on populations because individuals are unharmed. Therefore, nonlethal methods would not have any significant adverse impacts on nontarget populations of wildlife, including T&E species under this alternative.

Mammals could still be lethally removed during the regulated harvest season, when causing damage, and through the issuance of permits by the NJDFW under this alternative. The use of firearms and euthanasia is essentially selective for target species since animals are identified prior to application. In addition, federal, state and local laws and regulations, WS Directives, trap placement, and bait selection are employed for snares and body-gripping traps to minimize risks to nontargets. Therefore, no adverse impacts are anticipated from use of lethal methods.

WS personnel's pesticide training in combination with following label requirements presents a low risk of exposure of nontargets species to registered fumigants and toxicants. Only those repellents registered with the EPA and NJDEP pursuant to the FIFRA would be recommended and used by WS under this alternative. Toxicants, including restricted use toxicants, could be used by licensed non-WS' pesticide applicators. Therefore, the use and recommendation of repellents would not have negative impacts on nontarget species when used according to label requirements. Most repellents for mammals pose a very low risk to nontargets when exposed to or when ingested.

While every precaution is taken to safeguard against taking nontargets 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 lethal removal of unintended species. Those occurrences are infrequent and should not affect the overall populations of any species under the proposed action. WS' lethal removal of nontarget species during activities to reduce damage or threats to human safety associated with mammals is expected to be extremely low to non-existent. Between FY 2012 and FY 2016, only two nontarget mammals (one red fox and one eastern cottontail), five nontarget birds (one herring gull, one northern mockingbird, one common yellowthroat warbler, and two European starlings) and one nontarget fish (carp) were unintentionally lethally removed by WS in New Jersey. WS would monitor the lethal removal of nontarget species to ensure program activities or methodologies used in mammal damage management do not adversely impact nontargets. 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 USFWS and the NJDFW any nontarget lethal removal to ensure lethal removal by WS is considered as part of management objectives established. In addition, 16 nontargets (11 mammals, four birds, and one turtle) were released onsite during WS mammal damage management activities in FY 2012 through FY 2016. The potential impacts to nontargets are similar to the other alternatives and are considered to be minimal to non-existent.

The proposed mammal damage management could benefit many other wildlife species that are impacted by predation, habitat modification or competition for resources. For example, foxes often feed on the eggs, nestlings, and fledglings of ground nesting bird species such as piping plovers. 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.

Federally Listed Species - The current list of species designated as threatened and endangered in New Jersey as determined by the USFWS was obtained and reviewed during the development of this EA. Appendix B contains the list of species currently listed in the state.

Based on the species that are currently listed by the USFWS in New Jersey and the actions and methods that WS intends to use to address mammal damage management in the state, WS has made a "may effect, but not likely to adversely affect" determination for all federally listed species. If program activities change in scope or intensity, WS will consult with the USFWS as necessary to ensure the protection and sustainability of all T&E species. WS conducted an informal Section 7 consultation with the USFWS in which the USFWS concurred with WS' determination (Ron Popowski, USFWS, personal communication, 2017).

State Listed Species – The current list of state listed species as determined by the NJDFW was obtained and reviewed during the development of the EA (see Appendix C). Based on the review of species listed, WS has determined that the proposed activities would have no effect or would not likely adversely affect the species currently listed by the state.

Summary of nontarget animal impact analysis
WS continually monitors, evaluates and makes modifications as necessary to methods or strategies when providing direct operational assistance, to not only reduce damage but also to minimize potentially harmful effects to nontargets. Additionally, WS consults as required with the USFWS and the NJDFW to determine the potential risks to eagles and federally and state listed T&E species in accordance with the Bald and Golden Eagle Protection Act, ESA, and state laws. WS annually reports to these entities to ensure that any nontarget lethal removal by WS is considered as part of management objectives. Potential direct and cumulative impacts to nontargets, including T&E species, from the recommendation of methods by WS under this alternative would be expected to be insignificant. No indirect effects were identified for this issue.

Alternative 2 – WS Would Address Mammal Damage Using Technical Assistance Only

Under this alternative, WS would provide those persons requesting assistance with managing damage and threats associated with mammals with technical assistance only. Direct operational assistance provided by WS as described above would not be available.

Despite no direct involvement by WS in resolving damage and threats, those persons experiencing damage caused by mammals could continue to alleviate damage by employing both nonlethal and lethal methods. All methods listed in Appendix D would be available under this alternative although not all methods would be available for direct implementation by all persons. Nonlethal methods have the potential to inadvertently disperse nontarget animals while lethal methods have the potential to inadvertently capture or kill nontarget animals as described under Alternative 1.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent damage as permitted by federal, state, and local laws and regulations or those persons could take no action. Therefore, nontarget populations would not be directly impacted by WS from a program implementing technical assistance only.

Direct, Indirect, and Cumulative Effects:
If direct operational assistance is not provided by WS or other entities, it is possible that frustration caused by the inability to reduce damage and threats could lead to the inappropriate use of legal methods or the use of illegal methods which could lead to real but unknown effects on other animal populations. In the past, people have resorted to the illegal use of chemicals and methods to alleviate wildlife damage issues (White et al. 1989; USFWS 2001; FDA 2003).

Potential impacts to nontarget animals, including T&E species, from the recommendation of methods by WS under this alternative would be variable. If methods were employed as recommended by WS, potential direct or cumulative risks to nontargets would likely be low and similar to the proposed action / no action alternative. WS' involvement would not be additive to lethal removal that could occur since the individual requesting WS' assistance could conduct damage management activities without WS' involvement. However, if methods were not employed as recommended or methods that are not recommended were employed, potential direct, indirect or cumulative impacts to nontargets are likely to be higher. However, impacts would not be expected to be significant.

Alternative 3 – No Mammal Damage Management Conducted by WS

WS would not be involved with any aspect of managing damage associated with mammals. Therefore, WS would have no direct impact to nontargets or T&E species under this alternative. All requests for assistance received by WS to resolve damage associated with mammals would be referred to the NJDFW, the NJDA, local law enforcement or animal control authorities and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Mammals would continue to be lethally removed through permits issued by the NJDFW, during regulated hunting and trapping seasons, or without a permit as allowed in certain damage and nuisance situations by state laws and regulations.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

Direct, Indirect, and Cumulative Effects:
Potential impacts to nontarget species, including T&E species, would be variable under this alternative based upon the skills and abilities of the person implementing damage management actions under this alternative. The risks to nontargets and T&E species would be similar across the alternatives since most of those methods described in Appendix D would be available across the alternatives. If those methods available were applied as intended, direct, indirect, and cumulative effects to nontargets would be minimal to non-existent. If methods available were applied incorrectly or applied without knowledge of mammal behavior, risks to nontarget 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 nontargets 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 nontarget wildlife (e.g., (White et al. 1989; USFWS 2001; FDA 2003)). Therefore, adverse direct, indirect, or cumulative impacts to nontargets, including T&E species, could occur under this alternative; however WS does not anticipate any significant cumulative impacts.

Issue 3 – Effects of Damage Management Activities on the Regulated Harvest of Mammals

Another issue commonly identified as a concern is that damage management activities conducted by WS could affect the ability of hunters or trappers to harvest species targeted by management activities. Potential impacts could arise from both lethal and nonlethal damage management methods. Nonlethal methods disperse or otherwise make an area where damage is occurring unattractive to the target species causing the damage, thereby reducing the presence of those species in the area. Lethal methods remove individuals of the target species causing the damage, thereby reducing the local population and the presence of those species in the area. Therefore, lethal methods could reduce the local population or the presence of mammals in the area where damage management activities are occurring. Virginia opossum, eastern cottontail, woodchuck, gray squirrel, beaver, nutria, muskrat, coyote, red fox, gray fox, raccoon, mink, striped skunk, river otter, white-tailed deer and feral swine may be harvested by hunters and/or trappers.

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

Under the proposed action/no action alternative, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. The NJDFW is responsible for classifying mammals as furbearing animals, game animals or nuisance species. The NJDFW also establishes and enforces hunting/trapping seasons and regulations. With the exception of nutria and feral swine, the proposed number of lethally removed mammals would be of low magnitude when compared to the private harvest (see Issue 1, Alternative 1 for additional species specific information). Nutria and feral swine are non-native species and are not afforded any protection by the federal government.

Direct, Indirect, and Cumulative Effects:
With oversight by the NJDFW, the lethal removal of mammals by WS or the recommendation of lethal methods by WS would not limit the ability to harvest these species. All lethal removal by WS would be reported to the NJDFW annually to ensure that removal by WS is incorporated into cumulative population management objectives established for these species. Given the increasing or stable status of all the game and furbearing mammals outlined in the Population Analysis of Issue 1, WS' proposed lethal removal as well as the cumulative lethal removal from all known sources is below the level of removal that would cause a decrease in the population. Based on the limited lethal removal proposed by WS and the oversight by the NJDFW, WS' lethal removal of mammals under this alternative would have no direct, indirect, or cumulative effect on the ability of those people interested in harvesting these species.

Alternative 2 – WS Would Address Mammal Damage Using Technical Assistance Only

Under this alternative, WS would provide those persons requesting assistance with managing damage and threats associated with mammals with technical assistance only. Direct operational assistance provided by WS as described above would not be available. The provision of technical assistance by WS under this alternative is unlikely to increase the number of animals addressed because those individuals experiencing damage likely would employ both lethal and nonlethal methods in the absence of WS' assistance.

Direct, Indirect, and Cumulative Effects:
Since mammals could continue to be lethally removed or dispersed under this alternative, despite WS' lack of direct involvement, the ability to harvest these animals would be similar among the alternatives. WS' recommendation of methods would not limit the ability of those people interested in harvesting animals from doing so. The number of animals lethally removed annually would be regulated and adjusted by the NJDFW. Direct, indirect and cumulative effects would be similar to Alternative 1.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not be involved with any aspect of mammal damage management. Therefore, WS would have no direct impact on the ability to harvest animals under this alternative. Despite no involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods.

Direct, Indirect, and Cumulative Effects:
The number of animals lethally removed annually would be regulated and adjusted by the NJDFW. Direct, indirect and cumulative effects would be similar to Alternative 1.

Issue 4 - Effects of Damage Management Activities on Human Health and Safety

An additional issue often raised is the potential risks to human health and safety associated with the methods employed to manage damage associated with mammals. Both chemical and nonchemical methods have the potential to have adverse direct, indirect or cumulative effects on human health and safety. Risks can occur both to persons employing methods and persons coming into contact with methods. Risks can be inherent to the method itself or related to the misuse of the method. Potential effects of damage management activities on human health and safety under each of the three alternatives are analyzed below.

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

Under the proposed action / no action alternative, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. SOPs discussed in Chapter 2 ensure risks to human health and safety would be reduced or prevented. Pertinent SOPs include not only the WS Decision Model (WS Directive 2.201), an evaluation process for the appropriateness of methods (WS Directive 2.101) and the use of integrated management (WS Directive 2.105), but also several other precautions including the following. WS identifies hazards in advance of work assignments and provides employees with personal protective equipment (PPE). WS employees must adhere to safety requirements and use appropriate PPE. WS employees are required to work cooperatively to minimize hazards and immediately report unsafe working conditions (WS Directive 2.601). Damage management activities would be conducted away from areas of high human activity (e.g., in areas closed to the public) or during periods when human activity is low (e.g., early mornings, at night) to the extent possible. WS would only conduct mammal damage management activities on a given property in response to a request for assistance after the property owner or manger has signed a document agreeing to allow the use of specific methods on property they own and/or manage. Although hazards to human health and safety from both nonlethal and lethal methods exist, those methods would generally be regarded as safe when used by individuals trained and experienced in their use and with regard and consideration of possible risks to human health and safety.

To help ensure safe use and awareness, WS' employees who use firearms during official duties are required to attend an approved Hunter Education Course, an approved firearm safety training course, pass regular firearm qualifications, and complete annual practice requirements and written exam in accordance with WS Directive 2.615, WS Firearms Safety Training Manual, and WS Firearm Policy to remain certified for firearm use. As a condition of employment, WS' employees who carry and use firearms must pass a background check and are subject to random drug tests and 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)).

Direct, Indirect, and Cumulative Effects:
Nonchemical methods available for use under any of the alternatives are: live-capture traps (e.g., foot hold traps, cage traps), lethal traps (i.e., bodygrip traps) and snares (cable devices) (see Appendix D). The risk traps and snares pose to human health and safety are small to non-existent since traps can only be triggered through direct activation of the device. Therefore, if left undisturbed, these traps would pose no risk. WS would use traps and snares in compliance with applicable federal, state and local laws and regulations (WS Directive 2.210) as well as WS Directives. Signs warning of the use of these tools in public areas 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.

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 lethally removed using chemical methods would be disposed of in accordance with WS Directive 2.515. All euthanasia would occur in accordance with AVMA guidelines and whenever possible in the absence of the public to further minimize risks. All WS' personnel who apply fumigants and toxicants registered with the EPA pursuant to the FIFRA are licensed as pesticide applicators by the NJDEP. 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 lethally removed 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. 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 use of chemical immobilization and euthanasia drugs or substances is restricted. WS personnel that possess or use these substances would be trained and certified in accordance with WS Directive 2.430. WS personnel that use these drugs or substances would be required to wear appropriate PPE they are provided with (WS Directive 2.601). Additionally, "*the acquisition, storage, and use of* ...(these substances would be)... i*n compliance with applicable program, Federal, State, and local law and regulations*" (WS Directive 2.430). When using immobilizing drugs, WS would adhere to all established withdrawal times agreed upon by WS, the NJDFW, and veterinarian authorities. If WS receives a request to immobilize mammals during a period of time when the regulated harvest of those species was occurring or during period of time where the withdrawal period could overlap with a harvest season, WS would euthanize the animal or mark the animal with ear tags labeled with a "do not eat" warning. This would eliminate risks to human health and safety from persons consuming animals that had or potentially had immobilizing drugs remaining in their systems.

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. 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.

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

No adverse direct or indirect effects to human safety have occurred from WS' use of methods to alleviate mammal damage from FY 2012 through FY 2016. The risks to human safety from the use of nonlethal and lethal methods, when used appropriately and by trained personnel, are considered low. No adverse direct effects to human health and safety are expected through the use of live-capture traps and devices or other nonlethal 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, WS personnel are properly trained on the safe storage, transportation and use of 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.

Alternative 2 – WS Would Address Mammal Damage Using Technical Assistance Only

Under this alternative, WS would provide those persons requesting assistance with managing damage and threats associated with mammals with technical assistance only. Direct operational assistance provided by WS as described above would not be available. This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals.

Despite no direct involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage could continue to alleviate damage by employing both nonchemical and chemical methods. All methods listed in Appendix D would be available under this alternative although not all methods would be available for direct implementation by all persons.

Direct, Indirect, and Cumulative Effects:
Private efforts to reduce or prevent damage would be expected to increase, and would likely result in less experienced persons implementing damage management methods which may have a greater risk to human 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 impacts to humans.

Potential impacts to human health and safety from the recommendation of methods by WS under this alternative would be variable. If methods were employed as recommended by WS and according to label requirements, in the case of chemical methods, potential risks to human health would likely be similar to the proposed action / no action alternative. However, if methods were not employed as recommended or methods that are not recommended are employed, risks could increase. However, impacts would not be expected to be significant.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not be involved with any aspect of managing damage associated with mammals. Therefore, WS would have no direct impact to human health and safety under this alternative. All requests for assistance received by WS to resolve damage associated with mammals would be referred to the NJDFW, the NJDA, local law enforcement or animal control authorities and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage could continue to alleviate damage by employing both nonchemical and chemical methods. This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, private businesses and/or private individuals. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

Direct, Indirect, and Cumulative Effects:
Potential impacts to human health and safety would be variable under this alternative. If direct operational assistance and technical assistance is not provided by WS or other entities, it is possible that frustration caused by the inability to reduce damage and threats along with ignorance on how best to reduce damage and threats could lead to the inappropriate use of legal methods and the use of illegal methods. Illegal, unsafe, and environmentally unfriendly actions could lead to higher risk to health and safety. However, if appropriate direct operational assistance and technical assistance was provided by persons knowledgeable and experienced in managing damage caused by mammals, the risks would be similar to Alternative 2. Additionally, impacts would not be expected to be significant.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods

The issues of method humaneness and animal welfare concerns relating to the alternatives are discussed below.

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

Under the proposed action, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. Nonlethal methods which are used or recommended by WS are generally regarded as humane. Nonlethal methods would include resource management methods (*e.g.*, crop selection, habitat modification, modification of human behavior), exclusion devices, frightening devices, reproductive inhibitors, cage traps, nets, and repellents. Under this alternative, WS could employ or recommend methods such as shooting, trapping, toxicants/chemicals, and euthanasia which are viewed as inhumane by some persons, despite SOPs and federal, state and local laws and regulations designed to maximize humaneness. WS personnel are experienced, professional and humane in their use of management methods and always follow label directions. WS' use of methods under the proposed action/no action alternative would adhere to applicable state and local laws and regulations as well as WS' Directives (see Chapter 2 for WS Directives specific to methods). These include but are not limited to guidelines for the types of devices or drugs which can be used, frequency in which capture devices must be checked and manner in which they must be applied. When recommending methods, WS would caution against their misuse.

The AVMA states "... euthanasia is the act of inducing humane death in an animal" and "...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 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 efficacy and therefore, the humaneness of methods would be based on the skill and knowledge of the person employing methods. WS personnel are experienced professionals skilled in their use of methods. When selecting methods, WS evaluates all potential tools for their humaneness, effectiveness, ability to target specific species and individuals, as well as other factors. Consequently, management methods would be implemented by WS in the most humane manner possible. All methods listed in Appendix D would be available under any alternative although not all methods would be available for direct implementation by all persons. Therefore, the issue of humaneness associated with methods and any direct impacts would be similar across any of the alternatives since those methods could be employed in the absence of WS' involvement. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives.

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

mammal damage management methods are used in situations where nonlethal damage management methods are not practical or effective. No indirect or cumulative adverse impacts were identified for this issue.

Alternative 2 – WS Would Address Mammal Damage Using Technical Assistance Only

Under this alternative, WS would provide those persons requesting assistance with managing damage and threats associated with mammals with technical assistance only. Direct operational assistance provided by WS as described above would not be available.

Despite no direct involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. The issue of humaneness of methods under this alternative is likely to be perceived as similar to humaneness issues discussed under the proposed action/no action alternative. 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/no action alternative.

Direct, Indirect, and Cumulative Effects:
WS could instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target species and to ensure methods are used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by an individual would be based on the skill and knowledge of the requester in resolving the damage despite WS' demonstration or instruction. Therefore, a lack of understanding of the behavior of mammals or the improper identification of the animal causing damage along with inadequate knowledge and skill in using methodologies to alleviate the damage or threats 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/no action alternative.

Those people requesting assistance would be directly responsible for the use and placement of methods and if monitoring or checking of those methods does not occur in a timely manner, captured animals could experience suffering or distress. The amount of time an animal is restrained under the proposed action/no action alternative would be shorter compared to a technical assistance alternative if those persons requesting assistance and implementing methods are not as diligent or timely in checking methods if they have not had as much training. If those persons requesting assistance from WS apply methods recommended by WS as intended, then those methods would be applied as humanely as possible to minimize pain and distress. If those persons provided technical assistance by WS apply methods not recommended by WS or do not employ methods as intended or without regard for humaneness, then the issue of method humaneness would be of greater concern since pain and distress of animals would likely be higher.

Alternative 3 – No Mammal Damage Management Conducted by WS

Under this alternative, WS would not be involved with any aspect of managing damage associated with mammals. All requests for assistance received by WS to resolve damage associated with mammals would be referred to the NJDFW, the NJDA, local law enforcement or animal control authorities and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with mammals, those persons experiencing damage could continue to alleviate damage by employing both nonlethal and lethal methods. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods. A method considered inhumane would still be perceived as inhumane regardless of the person or entity applying the method. However, even methods generally regarded as being humane could be employed in inhumane ways. Methods could be employed inhumanely by those people inexperienced in the use of those methods or if those people were not as diligent in attending to those methods.

Direct, Indirect, and Cumulative Effects:
The efficacy and therefore, 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 despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the public to use to alleviate damage and threats associated with mammals. Therefore, those methods considered inhumane would continue to be available for use under this alternative. If those people experiencing damage apply those methods considered humane methods as intended and in consideration of the humane use of those methods, then the issue of method humaneness would be similar across the alternatives. If those persons experiencing damage were not provided with information and demonstration on the proper use of those methods and employed humane methods in ways that were inhumane, the issue of method humaneness could be greater under this alternative. However, the level at which people would apply humane methods inhumanely under this alternative based on a lack of assistance is difficult to determine and could just as likely be similar across the alternatives.

3.2 ISSUES NOT CONSIDERD FOR COMPARATIVE ANALYSIS

The following resource values are not expected to be significantly impacted by any of the alternatives analyzed as none of the alternatives cause any significant ground disturbance: soils, geology, minerals, water quality/quantity, flood plains, critical habitats (areas listed in T&E species recovery plans or labeled as such by the USFWS and/or the NJDFW), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. Therefore, these resources were not analyzed.

Additional issues were identified by WS during the scoping process of this EA that were considered but will not receive detailed analyses for the reasons provided. The following issues were considered but will not be analyzed in detail:

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. 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 FONSI. This EA addresses impacts for managing damage and threats to human safety associated with mammals in New Jersey to analyze individual and cumulative impacts, to provide a thorough analysis of other issues relevant to mammal damage management, and to provide 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 will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. As most mammals are regulated by the NJDFW, the best available data for analysis is often based on statewide population dynamics. For example, an EA on county level may not have sufficient data for that area and have to rely on statewide analysis anyway. 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.

WS' Impact on Biodiversity

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

A Loss Threshold Should Be Established Before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss can be tolerated by cooperators until the damage reaches a threshold where damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. Therefore, the threshold of damage or economic loss that can be tolerated is unique to the individual. In addition, establishing a threshold would be difficult or inappropriate to apply to human health and safety situations.

Mammal Damage Management Should Not Occur at Taxpayer Expense

Some individuals may believe that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based. Funding for mammal damage management activities is derived from federal appropriations and through cooperative funding. Activities conducted for the management of damage and threats to human safety from mammals would be funded through CSAs with individual property owners or associations. A minimal federal appropriation is allotted for the maintenance of the WS program in New Jersey. The remainder of the WS program is mostly fee-based. 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 CSAs between the requester and WS.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by mammals and that prove to be the most cost effective would receive the greatest application. As part of an integrated approach, evaluation of methods would continually occur to allow for those methods that are most effective at resolving damage or threats to be employed under similar

circumstance where mammals are causing damage or pose a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. The cost effectiveness of methods and the effectiveness of methods are linked.

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 managers when deemed appropriate by the resource owner. 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 enter into an agreement with a government agency. In particular, large industrial businesses, airports, and cities and towns may prefer to use WS because of security and safety issues. The relationship between WS and private industry is addressed in WS directive 3.101.

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 remove mammals. As described in Appendix D, the lethal removal of mammals with firearms by WS to alleviate damage or threats would occur using a rifle, air 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 lethal removal of mammals by WS using firearms occurs primarily from the use of rifles. However, the use of shotguns could be employed to lethally remove 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 exist that lead from bullets deposited in soil from shooting activities could lead to contamination of water, either ground water or surface water, from runoff. The amount of lead that becomes soluble in soil is usually very small (0.1-2.0%) (EPA 2005). 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. 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 (Stansley et al. 1992). Ingestion of lead shot, bullets or associated fragments is not considered a significant risk to fish and amphibians (Rattner et al. 2008).

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). These

studies suggest that the very low amounts of lead that could be deposited from damage management activities would have minimal effects on lead levels in soil and water.

Lead ammunition is only one of many sources of lead in the environment, including use of firearms for hunting and target shooting, lost fishing sinkers (an approximated 3,977 metric tons of lead fishing sinkers are sold in the United States annually (Rattner et al. 2008)), and airborne emissions from metals industries (such as lead smelters and iron and steel production), manufacturing industries and waste incineration that can settle into soil and water (EPA 2013a). Since the lethal removal of mammals can occur during regulated hunting seasons or through the issuance of permits by the NJDFW, WS' assistance with removing mammals would not be additive to the environmental status quo since those mammals removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement. The amount of lead deposited into the environment may be lowered by WS' involvement in mammal damage management activities. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that mammals are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement ensures mammal carcasses lethally removed using firearms would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures mammal carcass are removed from the environment to prevent the ingestion of lead in carcasses by scavengers. Based on current information, the risks associated with lead bullets that are deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or mammal carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water.

Effects of Beaver Dam Removal on the Status of Wetlands

The issue of WS' potential impacts to wetlands stems from beaver damage management, primarily from the removal of beaver dams. Beaver dam removal sometimes occurs in areas inundated by water resulting from flooding. Beavers build dams primarily in smaller riverine systems (intermittent and perennial streams and creeks). Dam material usually consists of mud, sticks, and other vegetative material. Their dams obstruct the normal flow of water and can change the preexisting hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment. The depth of the bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water.

Beaver dams, over time, can result in the establishment of new wetlands. The regulatory definition of a wetland stated by the USACE and the EPA (40 CFR 232.2) is: "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

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

The intent of most dam removal operations is not to drain old established wetlands. With few exceptions, requests received by WS to remove beaver dams have involved the removal of the dam to return an area to the condition that existed before the dam had been built, or before it had been affecting the area for more than a few years. WS' beaver damage management activities are primarily conducted to address damage to agricultural crops, timber resources, public property such as roads and bridges, and water management structures. Beaver dam removal activities would primarily be conducted on small watershed streams, tributary drainages, and ditches. Those activities could be described as small, exclusive projects conducted to restore water flow through previously existing channels.

In the majority of instances, beaver dam removal would be accomplished by manual methods (i.e., hand tools). WS' personnel do not utilize heavy equipment, such as trackhoes or backhoes, for beaver dam removal. Only the portion of the dam blocking the stream or ditch channel would be breached. In some instances, WS' activities involve the installation of structures to manage water levels at the site of a breached beaver dam.

If the area does not have hydric soils, it usually takes many years for them to develop and a wetland to become established; this often takes greater than five years as indicated by the Swampbuster provision of the Food Security Act. Most beaver dam removal by WS would be allowed under exemptions stated in 33 CFR parts 323 and 330 of Section 404 of the Clean Water Act or parts 3821 and 3822 of the Food Security Act. However, the removal of some beaver dams could trigger certain portions of Section 404 that require landowners to obtain permits from the USACE prior to removing a blockage. WS' personnel determine the proper course of action upon inspecting a beaver dam impoundment.

3.3 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, 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). Additionally, WS would not have a significant direct, indirect, or cumulative impact on the ability of hunters or trappers to harvest species targeted by management activities. WS would not have a significant direct, indirect or cumulative impact on nontarget animal populations or T&E species. Under the proposed action / no action alternative, direct impacts to human health and safety would be low, and indirect and cumulative impacts would be eliminated when methods are used appropriately in adherence with SOPs and label requirements by trained personnel. Similarly, adherence to SOPs and selection and implementation of methods by trained personnel insures methods would be implemented in the most humane manner possible under the proposed action / no action alternative. Any direct, indirect or cumulative impacts on humaneness would be in part up to a person's perception of humaneness and similar across the alternatives. Under the proposed action / no action alternative, the aesthetic values of mammals are not expected to be impacted directly, indirectly or cumulatively. WS' actions taken to minimize or eliminate damage would be constrained in scope, duration and intensity, for the purpose of minimizing or avoiding impacts. WS' SOPs are designed to reduce the potential negative effects of WS' actions by identifying and responding to both anticipated and unanticipated changes in wildlife populations and the environment. WS continually monitors, evaluates and makes modifications as necessary to methods or strategy when providing assistance, to not only reduce damage, but also to identify and minimize potentially harmful effects. This process allows WS to take into consideration other influences in the environment in order to avoid adverse impacts. Although some persons will likely be opposed to WS' participation in damage management activities, the analysis in this EA indicates that WS' integrated damage management program to reduce damage or threats associated with mammals, as

described in the proposed action/ no action alternative, would not result in significant adverse cumulative impacts on the quality of the human environment.

CHAPTER 4: LIST OF PREPARERS AND PERSONS CONSULTED

4.1 LIST OF PREPARERS

Aaron Guikema, USDA-WS, State Director, Pittstown, NJ
Nicole Rein, USDA-WS, Wildlife Biologist, Pomona, NJ
Christopher Croson, USDA-WS, Staff Wildlife Biologist, Elkins, WV

4.2 LIST OF PERSONS CONSULTED

USFWS – Migratory Bird
USFWS – Ecological Services
NJDFW

APPENDIX A: WORKS CITED

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APPENDIX B: FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Obtained from U.S. Fish and Wildlife Service, New Jersey Field Office, Ecological Services website https://www.fws.gov/northeast/njfieldoffice/pdf/Specieslist.pdf at accessed on December 18, 2018.

FEDERALLY LISTED, PROPOSED, AND CANDIDATE SPECIES IN NEW JERSEY

	COMMON NAME	SCIENTIFIC NAME	STATUS
REPTILES	Bog turtle	*Clemmys muhlenbergii*	T
BIRDS	Black rail	*Laterallus jamaicensis jamaicensis*	PT(4d)
	Piping plover	*Charadrius melodus*	T
	Red knot	*Calidris canutus rufa*	T
	Roseate tern*	*Sterna dougallii dougallii*	E
MAMMALS	Indiana bat	*Myotis sodalis*	E
	Northern long-eared bat	*Myotis septentrionalis*	T(4d)
INVERTEBRATES	Dwarf wedgemussel	*Alasmidonta heterodon*	E
	Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	T
PLANTS	Small whorled pogonia	*Isotria medeoloides*	T
	Swamp pink	*Helonias bullata*	T
	Knieskern's beaked-rush	*Rhynchospora knieskernii*	T
	American chaffseed	*Schwalbea americana*	E
	Sensitive joint-vetch	*Aeschynomene virginica*	T
	Seabeach amaranth	*Amaranthus pumilus*	T

*Transient occurrence only during migration.

For more information about federally listed species in New Jersey, please visit our website at:
http://www.fws.gov/northeast/njfieldoffice/endangered/

or contact:

U.S. Fish and Wildlife Service New Jersey Field Office
4 East Jimmie Leeds Road, Suite 4
Galloway, New Jersey 08205
Phone: (609) 646-9310

Note: For a complete listing of Endangered and Threatened Wildlife and Plants, refer to 50 CFR 17.11 and 17.12. For a more information visit http://www.fws.gov/endangered/

FEDERALLY LISTED SPECIES PRESUMED EXTIRPATED FROM NEW JERSEY		
Red-cockaded woodpecker	*Picoides borealis*	E
Gray wolf	*Canis lupus*	E
American burying beetle	*Nicrophorus americanus*	E
Karner blue butterfly	*Lycaeides melissa samuelis*	E
Mitchell's satyr butterfly	*Neonympha m. mitchellii*	E
Rusty patched bumble bee	*Bombus affinis*	E

LISTED MARINE SPECIES

Other federally listed species occur in and offshore of New Jersey for which principal responsibility is vested with the National Marine Fisheries Service (also called NOAA Fisheries). Contact:
Endangered Species Coordinator
NOAA Fisheries Service, Protected Resources Division
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, Massachusetts 01930-2276
(978) 281-9328
http://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/

STATUS		
E	Endangered Species	Any species that is in danger of extinction throughout all or a significant portion of its range.
T	Threatened Species	Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
T(4d)	4d Rule in Effect	Threatened species for which a special rule is in effect under Section 4(d) of the ESA, removing certain prohibitions that would otherwise be in place.
C	Candidate Species	Species that appear to warrant listing, but listing is currently precluded by higher priority actions. Although these species receive no substantive or procedural protection under the Endangered Species Act, Federal agencies and other planners are encouraged to consider these species in environmental planning.
P	Proposed Species	A species for which a proposed rule to list as endangered or threatened has been published in the *Federal Register*.
[PD]	Proposed for Delisting	A species for which a proposed rule to remove from the list of threaten and endangered species has been published in the *Federal Register.*

APPENDIX C: STATE LISTED THREATENED AND ENDANGERED SPECIES

The lists of New Jersey's endangered and threatened wildlife species are maintained by the Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP). These lists are used to determine protection and management actions necessary to ensure the survival of the state's endangered, threatened and other nongame wildlife. See the Species Status Assessment page for information on the listing process.

This work is made possible through voluntary contributions received through Check-off donations to the Endangered Wildlife Conservation Fund on the State Income Tax Form, the sale of Conserve Wildlife License Plates, and donations.

Endangered Species are those whose prospects for survival in New Jersey are in immediate danger because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance or contamination. Assistance is needed to prevent future extinction in New Jersey.

Threatened Species are those who may become endangered if conditions surrounding them begin to or continue to deteriorate.

There are other classifications for wildlife as well, including Stable, Species of Special Concern and Undetermined. For a complete listing of species monitored by the ENSP, see the Species Status Listing on the Conserve Wildlife Foundation of NJ website.

BIRDS			
Endangered		**Threatened**	
Bittern, American BR	*Botaurus lentiginosos* BR	Bobolink BR	*Dolichonyx oryzivorus* BR
Eagle, bald BR	*Haliaeetus leucocephalus* BR	Eagle, bald NB	*Haliaeetus leucocephalus* NB
Falcon, peregrine BR	*Falco peregrinus* BR	Egret, cattle BR	*Bubulcus ibis* BR
Goshawk, northern BR	*Accipiter gentilis* BR	Kestrel, American	*Falco sparverius*
Grebe, pied-billed BR	*Podilymbus podiceps* BR	Lark, horned BR	*Eremophila alpestris* BR
Harrier, northern BR	*Circus cyaneus* BR	Night-heron, black-crowned BR	*Nycticorax nycticorax* BR
Hawk, red-shouldered BR	*Buteo lineatus* BR	Night-heron, yellow-crowned	*Nyctanassa violacea*
Knot, red NB	*Calidris canutus* NB	Osprey BR	*Pandion haliaetus* BR
Owl, short-eared BR	*Asio flammeus* BR	Owl, barred	*Strix varia*
Plover, piping**	*Charadrius melodus***	Owl, long-eared	*Asio otus*
Rail, black BR	*Laterallus jamaicensis* BR	Rail, black NB	*Laterallus jamaicensis* NB

Sandpiper, upland	*Batramia longicauda*	Sparrow, grasshopper BR	*Ammodramus savannarum* BR
Shrike, loggerhead NB	*Lanius ludovicianus* NB	Sparrow, Savannah BR	*Passerculus sandwichensis* BR
Skimmer, black	*Rynchops niger*	Woodpecker, red-headed	*Melanerpes erythrocephalus*
Sparrow, Henslow's	*Ammodramus henslowii*		
Sparrow, vesper BR	*Pooecetes gramineus* BR		
Tern, least	*Sternula antillarum*		
Tern, roseate**	*Sterna dougallii***		
Warbler, golden-winged BR	*Vermivora chrysoptera* BR		
Wren, sedge	*Cistothorus platensis*		
**Federally endangered or threatened			
BR - Breeding population only; NB - non-breeding population only			

REPTILES			
Endangered		**Threatened**	
Rattlesnake, timber	*Crotalus h. horridus*	Snake, northern pine	*Pituophis m. melanoleucus*
Snake, corn	*Elaphe g. guttata*	Turtle, Atlantic green**	*Chelonia mydas***
Snake, queen	*Regina septemvittata*	Turtle, wood	*Glyptemys insculpta*
Turtle, bog**	*Glyptemys muhlenbergii***		
Hawksbill, Atlantic**	*Eretmochelys imbricata***		
Leatherback, Atlantic **	*Dermochelys coriacea***		
Loggerhead, Atlantic **	*Caretta caretta***		
Ridley, Atlantic **	*Lepidochelys kempii***		
**Federally endangered or threatened			

AMPHIBIANS			
Endangered		**Threatened**	
Salamander, blue-spotted	*Ambystoma laterale*	Salamander, eastern mud	*Pseudotriton montanus*
Salamander, eastern tiger	*Ambystoma tigrinum*	Salamander, long-tailed	*Eurycea longicauda*
Treefrog, southern gray	*Hyla chrysocelis*	Treefrog, pine barrens	*Hyla andersonii*

INVERTEBRATES			
Endangered		**Threatened**	
Beetle, American burying**	*Nicrophorus americanus***	Baskettail, robust(dragonfly)	*Epitheca spinosa*
Beetle, northeastern beach tiger**	*Cincindela d. dorsalis***	Clubtail, banner (dragonfly)	*Gomphus apomyius*
Copper, bronze	*Lycaena hyllus*	Clubtail, harpoon (dragonfly)	*Gomphus descriptus*
Floater, brook (mussel)	*Alasmidonta varicosa*	Elfin, frosted (butterfly)	*Callophrys irus*
Floater, green (mussel)	*Lasmigona subviridis*	Emerald, Kennedy's (dragonfly)	*Somatochlora kennedyi*
Petaltail, gray (dragonfly)	*Tachopteryx thoreyi*	Floater, triangle (mussel)	*Alasmidonta undulata*
Satyr, Mitchell's (butterfly)**	*Neonympha m. mitchellii***	Fritillary, silver-bordered (butterfly)	*Bolaria selene myrina*
Skipper, arogos (butterfly)	*Atrytone arogos arogos*	Jewelwing, superb (dragonfly)	*Calopteryx amata*
Skipper, Appalachian grizzled (butterfly)	*Pyrgus wyandot*	Lampmussel, eastern (mussel)	*Lampsilis radiata*
Wedgemussel, dwarf**	*Alasmidonta heterodon***	Lampmussel, yellow (mussel)	*Lampsilis cariosa*
		Mucket, tidewater (mussel)	*Leptodea ochracea*
		Pondmussel, eastern (mussel)	*Ligumia nasuta*
		Snaketail, brook, (dragonfly)	*Ophiogomphus asperses*
		White, checkered (butterfly)	*Pontia protodice*

**Federally endangered or threatened

MAMMALS	
Endangered	
Bat, Indiana**	*Myotis sodalis***
Bobcat	*Lynx rufus*
Whale, North Atlantic right**	*Eubalaena glacialis***
Whale, blue**	*Balaenoptera musculus***
Whale, fin**	*Balaenoptera physalus***
Whale, humpback**	*Megaptera novaeangliae***
Whale, sei**	*Balaenoptera borealis***
Whale,sperm**	*Physeter macrocephalus***
Woodrat, Allegheny	*Neotoma magister*
**Federally Endangered	

FISH	
Endangered	
Sturgeon, Atlantic**	*Acipenser oxyrinchus oxyrinchus***
Sturgeon, shortnose**	*Acipenser brevirostrum***
**Federally Endangered	

List updated 4/2/12; Obtained from NJDFW's website at http://www.njfishandwildlife.com/tandespp.htm accessed on August 24, 2017.

APPENDIX D: METHODS AVAILABLE FOR RESOLVING OR PREVENTING DAMAGE AND THREATS ASSOCIATED WITH MAMMALS IN THE STATE OF NEW JERSEY

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

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

A variety of methods are potentially available to the WS program relative to the management or reduction of damage from mammals. Various federal, state, and local statutes and regulations and WS directives govern WS' use of damage management tools and substances. WS develops and recommends or implements IWDM strategies based on resource management, physical exclusion, and wildlife management approaches. Within each approach there may be available a number of specific methods or tactics. The following methods and materials may be recommended or used in technical assistance and direct damage management efforts of the WS program.

Euthanized animals would be disposed of in accordance with WS Directives 2.515 and 2.430 to prevent exposure to nontarget animals.

Nonchemical Mammal Damage Management Methods

Nonchemical management methods consist primarily of tools or devices used to deter, capture or kill a particular animal or local population of wildlife to alleviate damage and conflicts. Methods may be nonlethal (e.g., fencing, frightening devices, etc.) or lethal (e.g., firearms, body gripping traps, snares, etc.). If WS personnel apply these methods on private lands, a Work Initiation Document or similar document must be signed by the landowner or administrator authorizing the use of each damage management method. Nonchemical methods used or recommended by WS include:

Exclusion restricts the access of mammals to resources or areas where damage is occurring through fencing, confinement or other barriers. Livestock or pets can be confined to barns, sheds or other structures when the risk of predation is greatest (e.g., night). Fences, either temporary or permanent, can be effective in excluding mammals. With conventional fencing, the fence should be tall enough and be installed with an underground skirt to prevent motivated mammals from jumping/climbing over or digging under fences. Barbed wire, rail, picket, cable wire and non-electrified high-tensile fences may not be effective at excluding mammals. In general, electric fencing is effective at reducing damage but some animals are willing to expose themselves to electric shock, can avoid electric wires while passing through, digging under or jumping over fences, or exploiting times when the fence isn't charged. 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. However, exclusionary devices which are 100% effective at excluding mammals can be more costly than the value of the resources being protected, especially for large areas. In addition, some exclusionary devices require labor intensive maintenance which can further reduce their cost-effectiveness.

Cultural methods and habitat management include 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, pruning or removing trees to eliminate a ladder from which raccoons can gain access to an attic, or planting lure crops on fringes of protected crops. In addition, altering human behavior may resolve conflicts between humans and animals. For example, eliminating the feeding of wildlife and free-ranging/feral animals may reduce the presence of animals in a given area and with it the damage occurring. This includes the inadvertent feeding created by improper disposal of garbage or leaving pet food outdoors where other animals can consume it.

Animal behavior modification 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. Unfortunately, many of these techniques are only effective for a short time before wildlife habituate to them (Conover 1982). As with other methods, these techniques tend to be more effective when used as part of an integrated management program. A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. In addition, devices activated by motion, body-heat or radar may delay habituation. Devices used to modify behavior in mammals include, but is not limited to:

- electronic guards (siren strobe-light devices)
- propane exploders
- pyrotechnics
- laser lights
- effigies which mimic a human or predator
- repellants (non-registered)
- nonlethal projectiles (water hose, paint balls)
- harassment / shooting into groups

It must be noted that sound-scare devices can also scare people, livestock, pets or nontarget wildlife when they are used in their vicinity.

Beaver dam breeching and removal not only restores natural hydrology, but it also often alleviates the damage associated with flooding, which may impact roads and private property. Removal involves the removal of materials with hand rakes, pitch forks, shovels, winches or other similar tools. It may also involve the use of heavy equipment. WS would not employ but may recommend the use of heavy equipment to resolve damage associated with beaver dams. While breeching involves pipe systems to move water through materials deposited by beavers, fence systems to exclude beavers from the area around a culvert, or water flow devices which the two systems.

Trained dogs may be used to assist in locating appropriate locations to place capture devices by alerting their handlers to areas where target animals have traveled, urinated or defecated. This use of trained dogs may increase the selectivity of both live and lethal capture methods. These dogs may also scent mark (urinate or defecate) which may serve as an attractant to other canids. Dogs trained

and used for these purposes must stay with their handler to be effective. Properly trained and disciplined dogs should not make contact with target animals and have minimal effect on nontarget animals. WS would use trained dogs in compliance with WS Directive 2.445.

Capture with live capture devices which can be employed are listed below. Upon capture, animals could be relocated or euthanized. However, in most situations animals captured in live traps are subsequently euthanized. For discussion of why animals are not generally relocated see Chapter 2.6: Trap and Translocate Mammal Only. Wild mammals are managed by the NJDFW and translocation could only occur under the authority of the NJDFW. Cats and dogs are managed by local law enforcement and animal control authorities. WS would transfer cats and dogs to a local animal pound/shelter or to the local animal control officer in accordance with WS New Jersey Policy per WS Directive 2.340. WS would use capture devices in compliance with applicable federal, state and local laws and regulations (WS Directive 2.210) as well as WS Directives to reduce risks to persons and nontarget animals.

Hand capture involves using ones' hands to take hold of an animal.

Catch poles are devices that allow animals to be restrained while keeping them a safe distance away. The device consists of a noose that is usually plastic coated cable at the end of a long pole. The operator of the pole can place the noose over the head and around the neck of an animal and tighten the noose to prevent the animal's escape. Commonly used by animal control professionals.

Hand nets are used to catch animals in confined areas. These nets resemble fishing dip nets with the exception that they are larger and have long handles. A variation of the hand net is a round throw-net with weights at the edges of the net, similar to that used for fishing.

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

Cannon/rocket nets involves setting bait in an area that would be completely contained within the dimensions of a propelled net triggered by an observer. The launching of the cannon/rocket net occurs too quickly for the animals to escape.

Drop nets are set above a food source and triggered by an observer.

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

Cage/box traps are live capture traps used to trap a variety of small to medium sized mammals. Cage traps are typically full-enclosed, come in a variety of sizes, are made of galvanized wire mesh, and consist of a treadle in the middle of the cage that triggers the door to close behind the animal after it enters the trap. Sherman™ traps are a specific type of box trap made of sheet metal instead of wire mesh and designed to capture small mammals or Eastern chipmunks. Clover traps are another specific type of box trap made with netting instead of wire mesh and designed specifically to capture deer.

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 1987). Colony traps are set at entrances to muskrat burrows or placed in muskrat travel lanes.

Hancock (e.g., suitcase/basket-type) traps are designed to live-capture beaver. As the name suggests, suitcase traps are shaped like a suitcase or clam shell with two identical halves that close to capture an animal when the triggering mechanism is engaged. Specifically designed for beaver, these traps have also been modified to capture otter.

Corral traps may be constructed from steel or wood supports with wire fencing and are typically circular in shape. They are open at both the top and bottom. These traps are used to capture animals alive. Animals enter through door(s) which are triggered by an observer, a trigger mechanism, or root stick. Alternatively, doors may be of a one way design, exploiting an animal's natural tendencies. For example, feral swine exhibit rooting behavior which makes them susceptible to being trapped in traps with doors that are hinged at the top and tilted inward at the bottom, and allow the animal to root underneath the door and enter the trap, but not exit.

Enclosed foot-hold traps are a live-restraint trap (e.g., EGG™ Trap, Lil' Grizz Get'rz™ Trap, Duffer's™ Trap etc.). The spring-powered devices, which are staked into the ground, grasp and restrain an animal by its foot when the animal reaches through a small opening to investigate an attractant. These traps are specifically designed to capture raccoons and opossums. Nontarget animals are excluded not only because of the size of the opening but also because of the dexterity required to pull on a lever and trigger the trap. Careful placement of traps at locations likely to capture target animals and the use of appropriate attractants further increases the selectivity of this method.

Snares (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 snare the loop becomes smaller in size, holding the animal as if it were on a leash. When used as a live capture device, snares are equipped with integrated stops that permit snaring, but do not choke the animal.

Glue boards consist of a rigid piece of plastic, cardboard or similar material with the horizontal surface coated in an adhesive. They are used for capture of insectivores or rodents that make contact with the adhesive. They do not cause a quick death of the animal trapped which generally die from dehydration and may be considered inhumane if they are not checked regularly. Trapped animals are either humanely euthanized or released (the glue can be deactivated with vegetable oil). Placement is along travel corridors used by the target species.

Attractants, including baits, scents or lures, are used to increase the efficacy of other methods by enticing an animal to investigate a particular location where capture methods (e.g., cage traps, corral traps, live-restraint traps) are deployed. These attractants can be either natural or synthetically based. Scents or lures are usually blends of volatile natural substances including urine, musk, organs (glands) and essential oils (Turkowski et al. 1983; Kimball et al. 2000). However, attractants can also be synthetically based. For example, fatty acid scent is a synthetic mixture of several volatile fatty acids found in fermented egg (Roughton 1982). Baits include any foods or combination of foods attractive to the target animal. Visual attractants (e.g., feathers) can also be used to entice an animal to investigate a particular location. These are non-restricted substances available for use by the public.

Lethal methods which can be employed are listed below. Lethal methods include forms of euthanasia such as shooting and cervical dislocation for live-trapped mammals, traps that quickly and

humanely kill target animal that activates trap, and removal of targeted mammals through shooting or recreational hunting and trapping. WS would employ methods in compliance with applicable federal, state and local laws and regulations (WS Directive 2.210).

Body-grip (e.g., Conibear-type) traps are designed to quickly and humanely kill the target animal that activates the trap. These two jawed devices are most commonly set underwater for the capture of aquatic rodents. Traps are specifically designed in different sizes for different sized animals. Traps are triggered to close when the animal attempts to move through the jaws and trips the wire triggers. Triggers can be configured to exclude nontarget animals. Rotating jaw traps can also be set within an enclosure (e.g., a tube or box) in a manner that excludes larger animals (i.e., the size of the enclosure, size of the opening, and distance from the opening to the trap serve to exclude nontargets). Careful placement of traps at locations likely to capture target animals and the use of appropriate attractants further increases the selectivity of this method.

Snap traps are similar to body-grip traps in that they are designed to cause the quick death of the animal that activates the trap. However, snap traps are small with a single jaw attached to a piece of wood or other stiff material. The trap is triggered to close when the baited treadle is disturbed by mice and rats. Careful placement of traps at locations likely to capture target animals and the use of appropriate attractants further increases the selectivity of this method.

Shooting is the practice of selectively removing target animals using firearms. Shooting, when deemed appropriate, can be highly effective in removing those individual animals responsible for causing damage and posing threats. It is also effective in supplementing harassment as part of an integrated approach. Removal of specific animals in the problem area can sometimes 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 quickly and selectively than some other methods, but it is not always effective. Shooting may sometimes be one of the only damage management options available if other factors preclude setting of damage management equipment. Shooting may also require the use of artificial light, night vision and Forward Looking Infrared equipment when conducted at night. In addition, shooting is used to euthanize mammals which are captured in live capture devices. WS personnel receive firearms safety training to use firearms that are necessary for performing their duties.

Recreational hunting and trapping is sometimes recommended by WS to resource owners as an option for reducing damage and threats associated with mammals. Although recreational hunting and trapping is impractical and/or prohibited in many urban-suburban areas, it can be used to reduce some populations of mammals in other areas. Valid hunting and trapping licenses are required for the implementation of this method unless exempt. Another option if applicable are Farmer Depredation Permits issued by NJDFW to aid in damage by deer or black bear.

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

Chemical Mammal Damage Management Methods

All pesticides used by WS are registered as required by the FIFRA (administered by the EPA and the NJDEP). WS personnel that use restricted-use chemicals are certified as pesticide applicators by NJDEP and are required to adhere to all certification requirements set forth in FIFRA and New Jersey pesticide control laws and regulations. Pharmaceutical drugs, including those used in wildlife capture and handling, are administrated by FDA and/or DEA. WS personnel that possess or use these substances would be trained and certified in accordance with WS Directive 2.430. When using immobilizing drugs, WS would adhere to all established withdrawal times agreed upon by WS, NJDFW and veterinarian authorities. Pesticides and pharmaceutical drugs are only used on private, public or tribal property sites with authorization from the property owner/manager. Methods such as repellents and reproduction inhibitors are also discussed below.

Ketamine Hydrochloride 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. For this reason, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. It can also be used alone to facilitate physical restraint. However, because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. Xylazine is commonly used with other drugs such as ketamine to produce relaxed anesthesia. The combination of these drugs suppresses undesirable side effects (e.g., the muscle tension commonly associated with Ketamine).

Telazol (Tiletamine-zolazepam) is another dissociative anesthetic used in wildlife capture. It is two-and-a-half to five 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.

Medetomidine (Medetomidine HCI) is an alpha-2 adrenergic agonist with sedative and analgesic properties. Medetomidine calms the animal and provides pain relief. Medetomidine is routinely used in combination with ketamine or tiletamine-zolazepam, and when the combinations are administered produce an animals that is very manageable and in a good state of analgesia. Medetomidine sedative effects can be reversed by atipamezole, tolazoline, or yohimbine.

Atipamezole (Atipamezole HCL) is an alpha-2 antagonist used to reverse the sedative effects of medetomidine and xylazine. Absorption of atipamezole is rapid which producing quick recovery times. Atipamezole typically reverses the sedative effect of medetomidine in 5-10 minutes. Atipamezole is highly selective which minimizes undesirable effects.

Tolazoline (Tolazoline HCL) is a combination alpha-1 and alpha-2 antagonist used to reverse the sedative effects of xylazine. Tolazoline works well on white-tailed deer, black-tailed deer, mule deer, moose, and blackbuck antelope. Reversal is quick typically within two minutes.

Yohimbine (Yohimbine HCL) is an alpha-2 antagonist used to reverse the sedative effects of xylazine. Yohimbine quickly reverses the sedative effects of xylazine, typically 2-10 minutes.

Additionally, cardiac side effects such as arrhythmia and bradycardia are reverse with yohimbine. Yohimbine is effective on a variety of carnivores and hoofstock, but not cervids.

Sodium pentobarbital with local anesthetic additives combines pentobarbital with another substance to hasten cardiac arrest. Specific drugs in this category include Beuthanasia –D Special® and Euthasol®. WS would only administer sodium pentobarbital via direct injection after target animals were captured using live capture devices and immobilized. This method is recognized by the AVMA as an acceptable method of euthanasia (AVMA 2013). The use of sodium pentobarbital is restricted. WS personnel that possess or use these substances would be trained and certified in accordance with WS Directive 2.430.

Potassium Chloride would only administer by WS via direct injection after target animals were captured using live capture devices and immobilized (see Capture with Live Capture Devices and Chemicals above). Potassium Chloride causes death by cardiac arrest. This method is recognized by the AVMA as an acceptable method of euthanasia (AVMA 2013). The use of potassium chloride is not restricted. WS personnel that use these drugs or substances would be required to wear appropriate PPE that they are provided (WS Directive 2.601). Euthanasia conducted by WS would be done in accordance with WS Directive 2.505.

Gas cartridges are incendiary devices composed of carbon and sodium nitrate. When ignited and placed in the target animal's burrow (woodchuck, red fox, coyote), the resultant carbon monoxide and other gases cause asphyxiation. The only risks to nontarget species are risks to rodents and other species found in burrows with the target species. WS will not use gas cartridges in areas where state and federally listed species may be in burrows with the target animal. Carbon monoxide is recognized by the AVMA as an acceptable method of euthanasia (AVMA 2001).

Rodenticides are pesticides that kill rodents. They are categorized according to how they work. Rodenticides which interfere with normal blood clotting are called anticoagulants. Rodenticides that work in other ways are called non-anticoagulants. Rodenticide products which are not restricted-use chemicals and therefore available for use by persons without a certified pesticide applicator's license contain rodenticides from both of these groups (EPA 2016). Under the proposed action/no action alternative, WS would only provide direct operational assistance with small mammals to manage damage or threats to agriculture, natural resources or to property and human health and safety relative to aviation safety. When recommending these methods, WS would caution those persons against their misuse.

Anticoagulants interfere with blood clotting and cause death from excessive bleeding. First-generation anticoagulants require several doses to cause death (e.g., chlorpophacinone, diphacinone and warfarin). Second-generation anticoagulants are more likely to cause death after a single dose (e.g., brodifacoum, bromadiolone, difenacoum, and difethialone). Anticoagulants would be used by WS in accordance with the label (EPA 1998a; 2008; 2013b), WS directives and SOPs to reduce risks to humans, nontarget animals and the environment.

Non-Anticoagulants may include the active ingredients bromethalin, cholecalciferol and zinc phosphide (EPA 2016). Both bromethalin and cholecalciferol are active ingredients in rodenticides available for use without a certified applicators license. Zinc phosphide is only available for use to certified applicators. Non-anticoagulants would be used by WS in accordance with the label (EPA 1998a; 1998b; 2008; 2013b), WS directives and SOPs to reduce risks to humans, nontarget animals and the environment.

Zinc phosphide is a restricted use pesticide and would therefore be available to persons with a certified applicators license under any of the alternatives. When ingested, zinc phosphide comes into contact with stomach acid and water producing phosphine gas which is absorbed through the stomach lining (EPA 1998b; Proudfoot 2009). Death by circulatory failure occurs because phosphine inhibits cellular respiration (EPA 1998b; Proudfoot 2009). Different formulations of zinc phosphide are registered for use with a variety of rodents. Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Tietjen 1976; Hegdal and Gatz 1977; Hegdal 1980; Hill and Carpenter 1982; Johnson and Fagerstone 1994). Zinc phosphide would be used by WS in accordance with label directions, WS Directives and SOPs which reduces risks to human health and safety.

Carbon Dioxide (CO_2) is sometimes used to euthanize mammals which are captured in live capture devices. 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 (AVMA 2001). 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 also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

Repellents are nonlethal chemicals used to discourage or disrupt particular behaviors of wildlife. There are three main types of chemical repellents: olfactory, taste, and tactile. Effective and practical chemical repellents should be nonhazardous to wildlife; nontoxic to humans, animals and the environment; resistant to weathering; easily applied; reasonably priced; and capable of providing good repellent qualities. The reaction of different individual animals to a single chemical formulation varies and this variation in repellency may be different from one habitat to the next. Examples include but are not limited to; Go AwayTM, Deer B Gon®, Ro-pel®, Deer Away®, Deer Off®, Liquid Fence®, Deer Stopper®, Deer Out®, and Rabbit & Groundhog Out®. Chemical repellents are registered for use on only a few species and are not available for many species which may present damage problems, such as some predators or furbearing species. Acceptable levels of damage control are usually not realized unless repellents are used in conjunction with other techniques.

Reproductive Inhibitors are reproductive control for wildlife which can be accomplished either through sterilization (permanent) or contraception (reversible) means. However, the use and effectiveness of reproductive control as a wildlife population management tool is limited by characteristics of the species (e.g., life expectancy, age at onset of reproduction, population size, etc.), environmental factors (e.g., isolation of target population, access to target individuals, etc.), socioeconomic, and other factors. Currently, the only reproductive inhibitor that is registered with the EPA for use in any of the species addressed in this document is GonaCon™. GonaCon™ was officially registered by the EPA in 2009 for use in reducing fertility in female white-tailed deer. According to the label, only WS or state wildlife management agency personnel or individuals working under their authority can use GonaCon™. However, in order for GonaCon™ to be used in any given state, the product must also be registered with the state and approved for use by the appropriate state agency responsible for managing wildlife. GonaCon™ is currently registered for use in New Jersey and requires a Special Permit to Inhibit Wildlife Reproduction issued by NJDFW.