ENVIRONMENTAL ASSESSMENT

MAMMAL DAMAGE MANAGEMENT IN THE STATE OF MAINE

Prepared by:

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

In cooperation with:

Maine Department of Inland Fisheries and Wildlife

United States Department of the Interior, Fish and Wildlife Services

November 2018

TABLE OF CONTENTS

ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BPL	Bureau of Parks and Lands
CCC	Cultural Carrying Capacity
CCP	Comprehensive Conservation Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Federal Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FY	Fiscal Year
IPM	Integrated Pest Management
IWDM	Integrated Wildlife Damage Management
MDABPC	Maine Department of Agriculture Board of Pesticides Control
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDM	Mammal Damage Management
MDOC	Maine Department of Conservation
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDM	Wildlife Damage Management
WS	Wildlife Services

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 Maine. The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program is the federal agency authorized to protect American resources from damage associated with wildlife (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 8351-8352) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 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 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, Memoranda of Understanding (MOUs), and partnership agreements between WS and other agencies. This EA will facilitate planning between cooperating agencies; WS, the USFWS and the Maine Department of Inland Fisheries and Wildlife (MDIFW) to initiate funding mechanisms under grant programs administered by the USFWS.

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

[1] The WS Program Directives (https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/sa_ws_program_directives/ct_ws_dir_ch2) provides guidance for WS personnel to conduct wildlife damage management activities. WS Directives referenced in this EA can be found in the manual or link provided but are not referenced in the Literature Cited Appendix.

management (MDM). 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 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].

Mammal species addressed in this EA include: masked shrew (*Sorex cinereus*), water shrew (*Sorex palustris*), smoky shrew (*Sorex fumeus*), northern short-tailed shrew (*Blarina brevicauda*), hairy-tailed mole (*Parascalops breweri*), star-nosed mole (*Condylura cristata*), deer mouse (*Peromyscus maniculatus*), white-footed mouse (*Peromyscus leucopus*), house mouse (*Mus musculus*), meadow jumping mouse (*Zapus hudsonius*), woodland jumping mouse (*Napaeozapus insignis*), southern redbacked vole (*Clethrionomys gapperi*), meadow vole (*Micotus pennsylvanicus*), woodland vole (*Microtus pinetorum*), southern bog lemming (*Synaptomys cooperi*), Norway rat (*Rattus norvegicus*), eastern chipmunk (*Tamias striatus*), red squirrel (*Tamiasciurus hudsonicus*), gray squirrel (*Sciurus carolinensus*), northern flying squirrel (*Glaucomys sabrinus*), woodchuck (*Marmota monax*), beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), eastern cottontail (*Sylvilagus floridanus*), New England cottontail (*Sylvilagus transitionalis*), muskrat (*Ondatra zibethicus*), porcupine (*Erethizon dorsatum*), raccoons (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), striped skunks (*Mephitis mephitis*), short-tailed weasel (*Mustela erminea*), long-tailed weasel (*Mustela frenata*), mink (*Neovison vison*), pine marten (*Martes americana*), fisher (*Pekania pennanti*), river otter (*Lutra canadensis*), feral cats (*Felis domesticus*), bobcats (*Lynx rufus*), feral dog (*Canis lupus familiaris*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), coyotes (*Canis latrans*), black bear (*Ursus americanus*), feral swine (*Sus scrofa*), white-tailed deer (*Odocoileus virginianus*), red deer (*Cervus elaphus*), fallow deer (*Dama dama*), sika deer (*Cervus nippon*), and moose (*Alces alces*).

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 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.

[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 (EIS) 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.

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 health and 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. Table 1.1 lists WS' technical assistance consultations involving mammal damage or threats of damage to those four major resource types from 2013 through 2017 in Maine. Technical assistance is provided by WS to people requesting assistance to resolve damage or the threat of damage by providing information and recommendations on wildlife 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.

Table 1.1 - WS' Technical assistance consultations conducted in Maine, 2013-2017

Species	Projects	Species	Projects
bear, black	28	moose	1
beaver	1,181	mouse, deer	10
bobcats	75	muskrat	1
cats, feral	3	opossum, Virginia	4
chipmunk, eastern	15	pig, feral	50
coyotes	105	porcupine	18
deer, fallow	5	raccoons	123
deer, red	18	rat, Norway	10
deer, sika	1	skunk, striped	99
deer, white-tailed	82	squirrel, gray	13
dog, feral	6	squirrel, northern flying	3
fisher	2	squirrel, red	18
fox, gray	78	vole (all)	11
fox, red	90	weasel (all)	3
hare, snowshoe	1	woodchuck	48
mole (all)	14	TOTAL	2,116

Table 1.2 lists the resource types to which mammal species can cause damage. Many of the mammal species can cause damage to or pose threats to a variety of resources. Most requests for assistance received by WS are associated with those mammal species causing damage or threats of damage to property and human health and safety. For example, many of those mammal species listed in Table 1.2 are potential vectors for zoonotic diseases or can damage property, such as houses, lawns, and businesses or damage infrastructure, such as dams, through digging and burrowing.

[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 1.2 - Mammal species addressed in the EA with WS requests for technical assistance received and the resource type damage by those species, from 2013 to 2017. Resource types: A=Agriculture, H=Human Health and Safety, N=Natural Resources, P=Property.

Species	Resource				Species	Resource			
	A	H	N	P		A	H	N	P
bear, black	X	X		X	moose			X	
beaver	X	X		X	mouse, deer				X
bobcats	X	X			muskrat				X
cats, feral	X			X	opossum, Virginia		X	X	X
chipmunk, eastern	X	X		X	pig, feral	X	X	X	X
coyotes	X	X	X	X	porcupine	X	X		X
deer, fallow			X		raccoons	X	X	X	X
deer, red			X		rat, Norway		X		X
deer, sika			X		skunk, striped	X	X		X
deer, white-tailed	X	X	X	X	squirrel, gray	X			X
dog, feral	X				squirrel, northern flying				X
fisher				X	squirrel, red	X			X
fox, gray	X	X	X		vole (all)	X			X
fox, red	X	X	X	X	weasel (all)	X			
hare, snowshoe				X	woodchuck	X	X		X
mole (all)	X			X					

Need for Mammal Damage Management to Protect Human Health and Safety

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

Zoonoses are a major concern of cooperators when requesting assistance for managing threats from mammals. Disease transmission can occur through direct interactions between humans and mammals as well as indirect interactions with pets and livestock that had contact with mammals. Pets and livestock often encounter and interact with mammals which can increase the opportunity of transmission of disease to humans. Table 1.1[4] shows common diseases affecting humans that can be transmitted by mammals in addition to diseases which affect other animals, including domestic species. These include viral, bacterial, mycotic (fungal), protozoal, and rickettsial diseases.

[4] Table 1.1 is not considered an exhaustive list of wildlife diseases that are considered infectious to humans that are carried by wildlife species. The zoonoses provided are the more common infectious diseases for the species addressed in this EA and are only a representation of the approximately 100 to 3,000 zoonoses known to exist.

Table 1.3 - Wildlife Diseases in the Eastern United States that Pose Potential Health Risks through Transmission to Humans (Beran 1994, Davidson and Nettles 1997, CDC 2017)

Disease	Causative Agent	Hosts[a]	Route of Human Exposure
Anthrax	*Bacillus antracis*	cats, dogs	inhalation, ingestion
Hantavirus	*Sin Nombre hantavirus*	mice	inhalation
Tularemia	*Francisella tularensis*	Hares, rabbits, mice	Inhalation, ingestion, direct contact
Tetanus	*Clostridium tetani*	mammals	direct contact
Dermatophilosis	*Dermatophilus congolensis*	mammals	direct contact
Pasteurellaceae	*Haemophilus influenzae*	mammals	bite or scratch
Salmonellosis	*Salmonella* spp.	mammals	ingestion
Yersinosis	*Yersinia* spp.	cats	ingestion
Chlamydioses	*Chlamydophilia felis*	cats	inhalation, direct contact
Typhus	*Rickettsia prowazekii*	opossums	inhalation, ticks, fleas
Sarcoptic mange	*Sarcoptes scabiei*	red fox, coyotes, dogs	direct contact
Trichinosis	*Trichinella spiralis*	raccoons, fox	ingestion, direct contact
Rabies	Rhabidovirus	mammals	direct contact
Visceral larval migrans	*Baylisascaris procyonis*	raccoons, skunks	ingestion, direct contact
Leptospirosis	*Leptospira interrogans*; 180 different serovars	mammals	ingestion, direct contact
Echinococcus	*Echinococcus multilocularis*	fox, coyotes	ingestion, direct contact
Toxoplasmosis	*Toxoplasma ondii*	cats, mammals	ingestion, direct contact
Spirometra	*Spirometra mansonoides*	bobcats, raccoons, fox, cats, dogs	ingestion, direct contact
Giardiasis	*Giardia lamblia, G. Duodenalis*	beavers, coyotes, cats, dogs	ingestion, direct contact
Cryptosporidiosis	*Cryptosporidium parvum, C. hominis, C. felis, s, C. canis, C. muris*	beavers, dogs, cats, mice	Ingestion, direct contact, possibly inhalation

[a] The host species provided for each zoonoses includes only those mammalian species addressed in this EA unless the zoonoses listed potentially infects a broad range of mammalian wildlife. Zoonoses infecting a broad range of mammals are denoted by the general term "mammals" as the host species. The diseases listed do not necessarily infect only those mammalian species covered under this EA but likely infect several species of mammals or groups of mammals. For a complete discussion of the more prevalent diseases in free-ranging mammals, please refer to Beran (1994) and Davidson and Nettles (1997).

Individuals or property owners that request assistance with mammals frequently are concerned about potential disease risks but are unaware of the types of diseases that can be transmitted by those animals.

In those types of situations, assistance is requested because of a perceived risk to human health or safety associated with wild animals living in close association with humans, from animals exhibiting abnormal behavior such as roving in human-inhabited areas during daylight, or showing no fear when humans are present.

In many circumstances when human health concerns are the primary reason for requesting WS' assistance there may have been no actual cases of transmission of disease to humans by mammals. Thus, it is the risk of disease transmission that is the primary reason for requesting and conducting wildlife management to lessen the threat of disease transmission. Situations where the threat of disease associated with wild or feral mammal populations include:

- Exposure of residents to the threat of raccoon rabies due to high densities of raccoons in urban settings or from companion animals coming in contact with infected raccoons.
- Disease threat to workers at industrial buildings/work sites that are exposed to fecal matter and animal contact by denning opossums
- Disease threat to the general public from beaver polluting drinking water with fecal matter

Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal that poses an indirect and direct threat to humans. Indirect threats to humans occur via exposure to pets or livestock that have been infected via bites of a rabid animal. Direct threats can occur by handling infected wildlife which may or may not exhibit aggressive animal behavior as a symptom of rabies infection. The disease can be effectively prevented in humans when exposure is identified early and treated while domestic animals and pets can be vaccinated for rabies. However, the abundant and widely distributed reservoir among wild mammals complicates rabies control. The vast majority of rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in raccoons, skunks (primarily *Mephitis mephitis*), and bats (Order Chiroptera) (USDA 2001). More information pertaining to rabies can be found through WS' National Rabies Management Program (https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/programs/nrmp/ct_rabies).

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

Diseases and parasites that affect feral cats and dogs can also affect humans and given the close association of those animals with humans and companion animals the risk of transmission is high. The topic of feral animals and their impacts on native wildlife and human health elicits a strong response in numerous professional and societal groups. Feral cats and dogs are considered by most professional wildlife groups to be a non-native species that has detrimental impacts to the native ecosystems especially in the presence of a human altered landscape. However, a segment of society views feral animals to be an extension of companion animals that should be cared for and for which affection bonds are often developed especially when societal groups feed and care for individual feral animals. Of special concern are those cats and dogs considered companion animals that are not confined at all times but are allowed to range outside the home for extended periods of time. Those companion animals are likely to encounter and become exposed to a wide-range of zoonoses that are brought back into the home upon return where direct contact with humans increases the likelihood of disease transmission, especially if interactions

occur between companion animals and feral animals of the same species. Feral animals that are considered companion animals are also likely to impact multiple people if infection occurs since those animals are likely to come in direct contact with several members of families and friends before diagnosis of a disease occurs.

Several diseases, including rabies, that are infectious to humans have been found in feral cats and dogs. A common zoonosis identified in cats is ringworm. Ringworm (*Tinea* spp.) is a contagious fungal disease contracted through direct interactions with an infected person, animal, or soil. Other common zoonoses transmitted by cats are pasteurella, salmonellosis cat scratch disease, and numerous parasites, including roundworms, tapeworms and *Toxoplasma gondii*.

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

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

This discussion on zoonoses is intended to briefly address the more commonly identified zoonoses found in those species specifically addressed in this EA, and is not intended to be an exhaustive discussion of all potential zoonoses. The transmission of diseases from wildlife to humans is not well documented or understood for most infectious zoonoses. Determining a vector for a human infected with a disease known to occur in wildlife populations is often complicated by the presence of the known agent across a broad range of naturally occurring sources. For example, a person with salmonellosis may have contracted the bacterium from direct contact with an infected pet or from eating undercooked meat or other sources.

However, wildlife and feral animals are known carriers of pathogens infectious to humans which increases the risk of transmission directly through contact with infected wildlife or feral animals and through exposure from contact with livestock and pets that have been exposed to diseased wildlife or feral animals. Few occurrences of pathogen transmission from wildlife to humans have been documented. However, this does not diminish the risk to humans. WS actively attempts to educate the public about the risks associated with disease transmission from wildlife to humans through technical assistance and by providing technical leaflets on the risks of exposure.

Requests are also received for assistance from a perceived threat of physical harm from wildlife. Human encroachment into wildlife habitat increases the likelihood of human-wildlife interactions. Species that humans are most likely to encounter are also most likely to adapt to and thrive in human altered habitat. Several predatory and omnivorous wildlife species thrive in urban habitats due to the availability of food,

water, and shelter. Many people purchase food specifically for feeding wildlife despite laws prohibiting the act in many areas. Feeding wildlife can result in higher densities and congregation of wildlife, which in turn can lead to pathogen transmission.

As people increasingly live in close proximity to wildlife, especially around urban areas, there can be a decline in the fear wildlife have toward humans. When wildlife species begin to habituate to the presence of humans and human activity, a loss of apprehension can occur that can lead to threatening behavior toward humans. Threatening behavior is considered aggressive posturing, a general lack of apprehension toward humans, or abnormal behavior. Though wildlife attacks occurs infrequently, the number of attacks appears to be increasing. Timm et al. (2004) reported that coyotes attacking people have increased in California. In addition, the highly publicized coyote attacks on children and adults in 2018 in New York, Massachusetts, and North Carolina have heightened people's awareness of the threat of such encounters. Often, wildlife exhibiting threatening behavior or a loss of apprehensiveness to the presence of humans is a direct result and indication of an animal inflicted with a disease. So, requests for assistance are caused by both a desire to reduce the threat of disease transmission and from fear of aggressive behavior either from an animal that is less apprehensive of people or induced as a symptom of disease. Black bears are known to spend time in urban and residential areas of Maine in search of food. As a result, not only is property damaged, but people's lives are put at risk when bears come into contact with them.

Need for Mammal Damage Management at Airports

Airports provide ideal conditions for many wildlife species due to the large grassy areas adjacent to brushy, forested habitat used as noise barriers. Airports are also often located within or adjacent to significantly urbanized environments. 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.

Between 1990 and 2015 in the United States, 3,572 aircraft strikes were reported to the FAA Wildlife Strike Database involving terrestrial mammals and 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 et al. 2015). Civil and military aircraft have collided with a reported 65 mammal species (43 terrestrial and 22 bat) from 1990 through 2015 (Dolbeer et al. 2016).

Since 1990, aircraft have struck 14 white-tailed deer, three skunks, one red fox, one porcupine, and one domestic dog in Maine according to reports filed with the FAA (FAA 2015). The number of mammals struck is likely slightly higher given that nearly 80% of all wildlife strikes go unreported to the FAA. Airports have requested assistance to manage the threat to human safety and damage to property caused by mammals present inside the area of operations of the airport. The infrequency of mammal strikes does not lessen the need to prevent threats to human safety and the prevention of damage to property. Preventing damage and reducing threats to human safety is the goal of those cooperators requesting assistance at airports given that a potential strike can lead to the loss of human life and considerable damage to property.

Wildlife populations near or 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 because they 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.

Emergency Response Efforts

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

Need for Mammal Damage Management to Protect Agricultural Resources

WS receives requests for assistance from agricultural producers experiencing damage problems from mammals including, but not limited to: predation of livestock, including poultry by coyotes and foxes, damage to crops and stored feed by woodchucks, raccoons and rodents, and risk of pathogen transmission. During 2001, crop and livestock losses from wildlife in the U.S. totaled $944 million, with field crop losses totaling $619 million, livestock and poultry losses totaling $178 million, and losses of vegetables, fruits and nuts totaling $146 million. Those losses include destruction of or damage to crops in the field and death or injury to livestock. In 2001, it was reported that raccoons were responsible for 6%, 3%, and 6% of the total damage to field crops; livestock and poultry; and vegetables, fruits, and nuts, respectively, in the U.S. (NASS 2002).

In 2005, NASS (2006) reported cattle and calf losses from wildlife predation totaled 190,000 head in the U.S. according to livestock producers. Wildlife predation represented 4.7% of the total cattle and calf losses reported by livestock producers in 2005 totaling $92.7 million in economic losses. Coyotes were indicated as the primary predator of livestock with 51.1% of cattle and calf losses attributed to coyotes. Producers spent nearly $199.1 million dollars on non-lethal methods to reduce cattle and calf losses from predation by wildlife in 2005 (NASS 2006). The primary non-lethal method employed by livestock producers was the use of guard animals with a reported 38% of producers using guard animals. Producers also reported using exclusion fencing, frequent checking, and culling as additional employed methods for reducing predation (NASS 2006).

In New England, NASS (2009) reported a total of 300 sheep and 400 lambs were killed in 2009 by wildlife predators. The economic loss from wildlife predators in New England was estimated at nearly $93,000 in 2009 (NASS 2009). NASS (2006) reported no losses to cattle from bobcat predation in Maine. However, U.S. cattle producers indicated mountain lions and bobcats[5] caused 7.7% of the cattle and calf losses attributed to wildlife predators in 2005 (NASS 2006). Bobcats are also known to predate on other livestock. In 2010 in the United States, the National Agriculture Statistics Service (NASS)

[5] The 2006 NASS cattle loss report groups mountain lion and bobcat predation into one category and does not separate losses attributed to the two species. Mountain lions, given their preference for larger prey, are likely the cause of most of the losses attributed to this category, especially to adult cattle. However, bobcats are known to prey upon calves though infrequently.

(2011) reported that 219,900 cattle and calves were lost due to predation with an estimated monetary value of $98,475,000.

Some of the most destructive mammals to agricultural resources included in this EA are raccoons and feral swine. This is not an uncommon problem; Pimentel et al. (2005) estimated that feral swine-related losses of agricultural commodities on a national scale exceeds $800 million in revenue annually. Feral swine can impact crops directly by consumption and indirectly through behaviors such as rooting, trampling and wallowing. Raccoons commonly damage field and sweet corn crops and have been shown to reduce their home ranges during the period when corn is most attractive to them (Beasley and Rhodes 2008). When surveying corn fields for damage, a study in northern Indiana found that 87% of damage events were attributed to raccoons (DeVault et al. 2007). Also, Beasley and Rhodes (2008) found a significant positive relationship between corn damage and raccoon abundance.

Additionally, cottontails and voles are reported to damage orchard trees by gnawing at the base of the tree. Trees are badly damaged or the bark is girdled and trees die when feeding by rabbits and voles is severe (Gill 1992). Similar damage occurs in nurseries, which grow landscape ornamentals and shrubs.

Being omnivorous, black bears have the potential to impact many different agricultural commodities including corn, livestock, and apiaries. In Wisconsin, bear damage to corn increased from 10% from 1939-1956 to 65% damage claims from 1986-1990. This is likely a consequence of using short-maturity corn varieties, started in the late 1970s. Bear damage costs total about $250,000 annually among 23 counties of Wisconsin (Stowell and Willging 1992). A Massachusetts survey asked agricultural producers their perceptions of bears and associated bear damage. Livestock and corn producers expressed that bear damage was low to moderate while beekeepers thought their losses were substantial to severe. Most damage cost estimates by producers were less than $1,000 per year (Jonker et al. 1998).

River otters and mink, and to a lesser extent bears and raccoons may prey on fish and other cultured species at hatcheries and aquaculture facilities (Bevan et al. 2002). River otters may even prey on fish in marine aquaculture facilities (Goldburg et al. 2001).

Wild mammals can also facilitate the spread of pathogens to livestock, for example, feral swine are potential reservoirs for diseases such as Brucellosis, Influenza A, Pseudorabies, Trichinella, and Hepatitis E that threaten the health of livestock and humans ((Bevins et al. 2014). Of greatest concern is infection of swine production facilities with diseases like swine brucellosis, pseudorabies, and leptospirosis (Beach 1993).

The domestic cat has been found to transmit *Toxoplasma gondii* to both domestic and wild animal species. Cats have been found to be important reservoirs and the only species known to allow for the completion of the life cycle for the protozoan parasite *T. gondii* (Dubey 1973, Teutsch et al. 1979). Both feral and domiciled cats may be infected by this protozoan, but this infection is more common in feral cats. Fitzgerald et al. (1984) documented that feral cats transmitted *T. gondii* to sheep in New Zealand, resulting in abortion in ewes. The authors also found *Sarcocystis* spp. contamination in the musculature of sheep. Dubey et al. (1995) found cats to be 68.3% positive for seroprevalence of *Toxoplasma gondii* on swine farms in Illinois and the major reservoir for this disease. The main sources for infecting cats are thought to be birds and mice.

Diseases that may be communicable from feral cats to companion cats include feline panleukopenia (FPL) infection, feline calicivirus infection, feline reovirus infection, and feline syncytium-forming virus infection (Gillespie and Scott 1973). Of the four feline diseases, feline panleukopenia is considered to be the most serious. Reif (1976) found that during the acute stages of feline panleukopenia, fleas were

vectors of this disease to other cats. FPL infection is cyclic in nature, being more prevalent in the July to September time period.

Need for Mammal Damage Management to Protect Natural Resources

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

Mammals causing damage are often locally overabundant at the damage site and threaten the welfare of a particular species population identified as a natural resource. An example of this would be a local ground-nesting game bird population which is being decimated by the presence of mammalian carnivores, such as raccoons, opossums, feral cats, or fox.

Piping plovers are state-endangered, federally threatened, shorebirds that breed on sandy beach habitats. There are less than 2,000 pairs of Atlantic Coast piping plovers in existence today. A minimum of 1.25 fledglings per pair is thought to be necessary for a stable population, while 1.5 is the goal identified in the federal Recovery Plan and is also the minimum goal within the State's Wildlife Conservation Strategy. In 2017, productivity was at an average of 2.29 at beaches where predation management was conducted by WS, compared to 1.26 where predation management was not conducted (Vashon Pers. Comm. 2018). The piping plover population decline was attributed to habitat loss and predation by raccoons, red fox, gray fox, skunks, mink, short-tailed weasels, long-tailed weasels, feral cats, and coyotes (ME WS Predator EA 2012).

Least terns are state-endangered water birds and are listed as a high priority for conservation within Bird Conservation Region 30. Least tern colonies have suffered intense nest and chick predation in recent years. In 2005, predation forced abandonment of traditional mainland nesting grounds and relocation of a portion of the colony to Stratton Island, where sandy beach habitat is limited and pathogen transmission and competition from the thousands of common terns is of concern. In 2017, least terns nested at a total of five beaches in Maine, on which 2 of the beaches received predation management. State-wide productivity for least terns in 2017 was 0.08 fledglings/pair. The two beaches where predation management was conducted had productivity rates that were above average (Vashon pers. Comm. 2018). Least terns have the potential to be adversely impacted by mammals, mainly raccoons, fox, and skunks (ME WS Predator EA 2012).

MIDFW is in the beginning phases of translocating New England cottontail rabbits from captive breeding facilities to specific sites in Maine. Long-tailed weasels are a significant predator to New England cottontail rabbits, and MDIFW is currently evaluating the feasibility and effectiveness of trapping these animals around NEC release sites. There is the potential that that WS could become involved in predator control efforts at release sites.

Scientists estimate that nationwide cats kill hundreds of millions of birds and more than a billion small mammals, such as rabbits, squirrels, and chipmunks, each year. Most recently, Loss et al. (2013) estimated that free-ranging cats kill 1.4 to 3.7 billion birds and 6.9 to 20.7 billion mammals worldwide annually. Cats kill common species such as cardinals, blue jays, and house wrens, as well as rare and endangered species such as piping plovers, Florida scrub-jays, and California least terns (American Bird

Conservancy (ABC) 2011). Some feral and free-ranging cats kill more than 100 animals each year. One well-fed cat that roamed a wildlife experiment station was recorded to have killed more than 1,600 animals (mostly small mammals) over 18 months (ABC 2011). Researchers at the University of Wisconsin coupled their four-year cat predation study with the data from other studies, and estimated that rural feral and free-ranging cats kill at least 7.8 million and perhaps as many as 217 million birds a year in Wisconsin. In some parts of the state, feral and free ranging cat densities reach 114 cats per square mile, outnumbering all similar-sized native predators (Coleman et al. 1997). Churcher and Lawton (1989) observed 77 well fed free-ranging cats in a Britain village for one year. The authors estimated that 30% to 50% of a cat's catch were birds and that the cats had significantly affected house sparrow populations within the village. Based on information acquired in this study, it was estimated that more than 20 million birds are killed by cats in Britain each year with more than 70 million animals overall being taken by cats annually.

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

Cats can have significant impacts on local wildlife populations, especially in habitat "islands" such as suburban and urban parks, wildlife refuges, and other areas surrounded by human development. The loss of bird species from habitat islands is well documented and nest predation is an important cause of the decline of neotropical migrants (ABC 2011). A two year study was conducted in two parks with grassland habitat. The researchers concluded, "Cats at artificially high densities, sustained by supplemental feeding, reduce abundance of native rodent and bird populations, change the rodent species composition, and may facilitate the expansion of the house mouse into new areas" (Hawkins et al. 1999).

Impacts from cat predation are not always direct, and can be indirect in the form of competition for food resources. George (1974) speculated that domestic cats were not a direct limiting factor on bird populations. However, the author did find evidence indicating cats indirectly could affect some birds-of prey by competing for a limited resource (primarily microtine rodents).

Non-native mammals can pose a serious disease threat to native wildlife. Across the United States (U.S.), as human populations have expanded, wildlife species have been introduced into new areas, and land has been transformed to meet human needs. Those changes often increase the potential for conflicts between wildlife and people that result in damage to resources and threaten human health and safety. One encroachment on native ecosystems is the introduction of non-native, invasive species into naïve environments. Invasive species often compete with native plants and wildlife and can threaten biodiversity. The number of invasive species introduced in the history of the U.S. has been estimated at 50,000 species (Pimentel et al. 2005). Some introduced species benefit society, such as corn, wheat, cattle, poultry, and other food items. Nearly 98% of the food system in the U.S. is derived from introduced species (USBC 2001, Pimentel et al. 2005). Other invasive species have caused considerable economic and environmental damage. Pimentel et al. (2005) estimated invasive species cause nearly $120 billion in environmental damages and losses in the U.S. annually. Of particular concern are the impacts of invasive species on threatened and endangered (T&E) species worldwide. Invasive species negatively impact nearly 42% of the species listed as T&E in the U.S. (Wilcove et al. 1998, Pimentel et al. 2005). Worldwide nearly 80% of wildlife populations at risk of extinction are threatened or negatively impacted by invasive species (Pimentel et al. 2005).

Feral swine are considered an invasive species that are expanding and increasingly causing damage to a variety of resources (West et al. 2009). Red deer, fallow deer, and sika deer after escaping from a farm all have the potential to expose chronic wasting disease to native cervids (MDACF 2016).

Coyotes can pose a threat to the white-tailed deer herd during the winter months (Martin 2009). During the winter months, deer are forced to congregate in deer yards (mature coniferous forests) for cover from winter conditions such as cold temperatures and deep snow. At this time, deer are vulnerable to predation due to snow depth and limited food supply. Deer sink down in the snow more than coyotes and can lose their ability to escape. Also, due to the snow depth, deer are limited in their ability to search out new feeding areas. Therefore, energy is conserved at all costs as it is difficult to replenish. At this time of year, deer mortality increases, with one of the contributing factors being predation (Martin 2009). The Department of Inland Fisheries and Wildlife established a Deer Predation Advisory Group to assist with developing and implementing a program to control predation on deer. This advisory group is a result of Public Law, Chapter 381, LD 1569 "An Act to Restore the White-tailed Deer Population and Improve Maine's Wildlife Economy and Heritage". LD 1569, Section 7 speaks to "predator control and deer protection on public lands;" additional language in Section 10 states that a Predator Control and Deer Habitat Fund within MDIFW will be established to be used by the Commissioner to fund or assist in funding predator control and to enhance deer habitat (Pratte and Ritchie 2011).

1.2.5 Need for Mammal Damage Management to Protect Property

Mammals cause damage to a variety of property types each year. Raccoons, skunks, woodchucks, and porcupines can cause damage to property by digging under porches and homes, chewing on buildings, leaving fecal matter and nesting material in buildings, and damaging turf, landscaping, flowers, and trees. Skunks often cause damage to lawns and turf while digging for grubs and insects.

WS received reports of damages or threats of damage caused by mammals to aircraft, airport runways and taxiways. The direct threat of aircraft strikes with mammals can cause substantial damage requiring costly repairs and aircraft downtime. Indirect threats to aircraft may result from large populations of small mammals such as rabbits, mice, and voles attracting larger mammalian and avian predators to the airfield and increasing the risk of a wildlife strike.

Beaver populations have increased substantially in the United States with the induction of a regulated trapping season as well as low pelt prices driving the trapping pressures down. The low trapping pressure has not only allowed populations to expand but it also has allowed for beaver damage losses to increase (Bhat et al. 1993). While beneficial to many other wildlife species, dam-building by immigrating beavers has caused significant flooding damage around the country costing millions of dollars. Beavers damage property in a number of different ways including but not limited to; the girdling or cutting of ornamental trees, flooding of pasture lands, cropland, residential areas, and timberland, and damming of culverts and bridges causing flooding and erosion of roadways and railroad beds.

Black bears are known to cause property damage. Bears damage homes, camps, and sheds, usually in search of food. During the process of black bears damaging property, human lives and safety can also be put at risk.

Burrowing activities of woodchuck, muskrat, and beaver can severely damage levees, dikes, earthen dams, landfills, and other structures (FEMA 2005). Woodchucks burrow under roadbeds and embankments and could potentially weaken or cause the collapse of these structures. Woodchucks also cause damage by chewing underground utility cables, sometimes resulting in power outages.

Additionally, woodchuck burrows may cause damage to property when tractors and other equipment drop into a burrow or roll over due to a burrow.

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

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 and 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 (NEPA) 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 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. As the authority for the management of mammal populations in the state, the MDIFW was involved in reviewing the EA and providing input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The MDIFW is responsible for managing wildlife in the state, including those mammalian species addressed in this EA, and establishes and enforces regulated hunting and trapping seasons. WS' activities to reduce and/or prevent mammal damage under the

alternatives would be coordinated with the MDIFW which would ensure WS' actions are incorporated into population objectives established for mammal species.

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

- How can WS best respond to the need to reduce mammal damage?
- Do the alternatives have significant impacts meriting an EIS?

1.5 AFFECTED ENVIRONMENT

Mammals can be found across Maine 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, Cooperative Service Agreement (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, and municipal lands in Maine 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 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 Maine where additional agreements may be signed in the future.

Federal, State, County, City, and Private Lands

Under two of the alternatives, WS could continue to provide MDM activities on federal, state, county, municipal, and private land in Maine 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

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

requesting WS' assistance. Therefore, the activities and methods addressed under the alternatives would include those activities that would be employed on Native American lands, when requested and when agreed upon by the Tribe and WS.

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 agreements may be signed in the future. Because the need for action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional 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 mammal damage must be viewed as being conceptually similar to the actions of other entities whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. Although some 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 MDM. 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 Maine. 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 AGENCIES INVOVLED IN THIS ENVIRONMENTAL ASSESSMENT AND THEIR ROLES AND AUTHORITIES

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

WS' Legislative Authority

The primary statutory authority for the WS program is the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C.

8351-8352) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 8353). The WS program is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human health and safety associated with wildlife. WS' Directives define program objectives and guide WS' activities in managing wildlife damage.

Maine Department of Inland Fisheries and Wildlife

The MDIFW has authority in wildlife management given under Maine Revised Statutes Annotated Title 12. This legislation covers general provisions; licenses, permits and stamps generally; wildlife generally; fish; wild animals and threatened and endangered species. The MDIFW is responsible for preserving, protecting and enhancing the inland fisheries and wildlife resources of the state.

Maine Department of Agriculture Board of Pesticides Control (MDABPC)

The MDABPC carries out the day to day responsibilities of regulating pesticides in the State of Maine and helps to protect people and the environment by ensuring the safe and appropriate use of pesticides. The main goal of the BPC is to prevent adverse human health or environmental effects from the misuse of pesticides. The BPC is responsible for enforcing all pesticide regulations and laws, both state and federal. It is responsible for carrying out provisions of the Maine Pesticide Control Act. These responsibilities include the registration of pesticides, controlling the pesticide products being used in the state, certification of pesticide applicators and enforcement of pesticide use as specified on labels. Through cooperative agreements with the Environmental Protection Agency, the department also implements provisions of the FIFRA.

U.S. 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 habitats. The USFWS mission is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Responsibilities are shared with other federal, state, tribal, and local entities; however, the USFWS has specific responsibilities for the T&E species protection under the ESA, migratory birds, interjurisdictional fish, and certain marine mammals, as well as for lands and waters that the USFWS administers for the management and protection of those resources.

CFR 50 Subchapter C - The National Wildlife Refuge System - Part 30 - Feral Animals

Subpart B-30.11 - Control of feral animals states: (a) Feral animals, including horses, burros, cattle, swine, sheep, goats, reindeer, dogs, and cats, without ownership that have reverted to the wild from a domestic state may be taken by authorized Federal or state personnel or by private persons operating under permit in accordance with applicable provisions of federal or state law or regulation.

The USFWS is also responsible for the protection and management of those populations, species, and subspecies that are considered threatened or endangered under the ESA.

U.S. 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. The EPA is also responsible for administering and enforcing the Section 404 program of the Clean Water Act with the

Corps; this established a permit program for the review and approval of water quality standards that directly impact wetlands.

Federal Aviation Administration (FAA)

The FAA is responsible for providing the safest and most efficient aerospace system in the world. The FAA regulates all aspects of civil aviation, including the construction and operation of airports, management of air traffic, and the certification of aircraft and personnel.

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 Clean Water Act (CWA).

1.7 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

Supplemental Environmental Assessment – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Fox, and Coyotes in the United States

WS issued an EA that analyzed the environmental effects of WS' involvement in the funding of and participation in Oral Rabies Vaccination programs to eliminate or stop the spread of raccoon rabies in a number of eastern states (including Maine) and gray fox and coyote rabies in Texas. The EA has been supplemented to analyze changes in the scope and analysis area of the ORV program. The most recent Decision/FONSI was signed on January 6, 2009. WS determined the action would not have any significant impact on the quality of the human environment.

Environmental Assessment: Reducing the Effects of Predation on Threatened and Endangered Birds in the State of Maine

WS has developed an Environmental Assessment that assesses the effects of WS activities in Maine for the management of red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), striped skunk (Mephitis mephitis), mink (*Mustela vison*), long-tailed weasel (*Mustela frenata*), short-tailed weasel (*Mustela erminea*), river otter (*Lutra Canadensis*), feral and domestic cat (*Felis spp.*), feral and domestic dog (*Canis spp.*), red squirrel

(*Tamiasciurus hudsonicus*), chipmunks (*Tamias striatus*), American kestrel (*Falco sparverius*), merlin (*Falco columbarius*), and great horned owl (*Bubo virginianus*) predation on threatened and endangered birds nesting on coastal islands, and coastal beaches within the State of Maine.

Environmental Impact Statement - Feral Swine Damage Management: A National Approach

APHIS-WS 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*b*). 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 mammal damage management were initially developed by WS and stakeholder feedback/consultations. 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 is being noticed 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 provides a minimum of a 30-day comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives raised after publication of public notices would be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final decision or publication of a notice of intent to prepare an EIS.

1.9 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 MDIFW, 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 through the ESA. In Maine, 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 allowing them to be killed or taken by anyone at any time when they are committing damage. For mammal damage management, the MDIFW 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 would be used, WS' involvement in the action would not affect the environmental status quo. Given that nonfederal entities can receive authorization to use lethal MDM methods from the MDIFW (depending on the species state classification), and since most methods for resolving damage are available to both WS and to non-federal entities, WS' decision-making ability is restricted to one of three alternatives: 1) WS can either take the action using the specific methods discussed in this EA upon request; 2) WS can provide non-lethal technical assistance only; 3) or WS can take no action, at which point the non-federal entity could take action anyway using the same methods during the hunting or trapping season, or through the issuance of a permit by the MDIFW. Under those circumstances, WS would have virtually no ability to affect the environmental status quo because the action would likely occur in the absence of WS' direct involvement.

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. In addition, WS will comply with all local laws and ordinances.

National Environmental Policy Act (NEPA). All Federal actions are subject to NEPA (Public Law 91190, 42 U.S.C. 4321 et seq.). WS follows the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500 et seq.), USDA NEPA implementing regulations (7 CFR 1b), and the APHIS Implementing Procedures (7 CFR 372) as a part of the decision-making process. NEPA sets forth the requirement that Federal actions with the potential to significantly affect the human environment be evaluated in terms of their impacts for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated, in part, by CEQ through regulations in Title 40, Code of Federal Regulations, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

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

Endangered Species Act (ESA). It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act (Sec. 2(c)). Wildlife Services conducts Section 7 consultations with the United States Fish and Wildlife Service (USFWS) to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency... is not likely to jeopardize the continued existence of any endangered or threatened species . . . each agency shall use the best scientific and commercial data available" (Sec. 7(a)(2)). WS has completed a Section 7 consultation with the USFWS on the risks to federally-listed threatened and endangered species from the proposed MDM program and will incorporate all USFWS provisions for the protection of threatened and endangered species from that consultation in program activities.

Bald and Golden Eagle Protection Act (16 USC 668-668c), as amended. Populations of bald eagles showed periods of steep declines in the lower United States during the early 1900s attributed to the loss of nesting habitat, hunting, poisoning, and pesticide contamination. To curtail declining trends in bald eagles, Congress passed the Bald Eagle Protection Act (16 USC 668) in 1940 prohibiting the take or possession of bald eagles or their parts. The Bald Eagle Protection Act was amended in 1962 to include the golden eagle and is now referred to as the Bald and Golden Eagle Protection Act. Certain populations of bald eagles were listed as "endangered" under the Endangered Species Preservation Act of 1966, which was extended when the modern Endangered Species Act (ESA) was passed in 1973. The "endangered" status was extended to all populations of bald eagles in the lower 48 states, except populations of bald eagles in Minnesota, Wisconsin, Michigan, Washington, and Oregon, which were listed as "threatened" in 1978. As recovery goals for bald eagle populations began to be reached in 1995, all populations of eagles in the lower 48 States were reclassified as "threatened". In 1999, the recovery goals for populations of eagles had been reached or exceeded and the eagle was proposed for removal from the ESA. The bald eagle was officially de-listed from the ESA on June 28, 2007 with the exception of the Sonora Desert bald eagle population. Although officially removed from the protection of the ESA across most of its range, the bald eagle is still afforded protection under the Bald and Golden Eagle Protection Act.

Under the Bald and Golden Eagle Protection Act (16 USC 668-668c), the take of bald eagles is prohibited without a permit from the USFWS. Under the Act, the definition of "take" includes actions that "*pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb*" eagles. The regulations authorize the 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.

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, to identify uses of the area to be regulated by the state, the mechanism (criteria, standards or regulations) for controlling such uses, and 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. WS has consulted with the Maine Office of Coastal Management regarding consistency of the proposed program with the State Coastal Zone Management Plan in accordance with the provisions of the Act.

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

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

Occupational Safety and Health Act of 1970. The Occupational Safety and Health Act of 1970 and its implementing regulations (29CFR1910) on sanitation standards states that "Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected." This standard includes mammals that may cause safety and health concerns at workplaces.

The Clean Water Act (33 U.S.C. 1344). The Clean Water Act provides regulatory authority and guidelines for the EPA and the U.S. Army Corps of Engineers (USACE) related to wetlands. Several Sections of the Clean Water Act pertain to regulating effects on wetlands. Section 101 specifies the objectives of this Act, which are implemented largely through Subchapter III (Standards and Enforcement), Section 301 (Prohibitions). The discharge of dredged or fill material into waters of the United States is subject to permitting specified under Subchapter IV (Permits and Licenses) of this Act. Section 401 (Certification) specifies additional requirements for permit review particularly at the State level. WS consults with appropriate regulatory authorities when wetlands exist in proximity to proposed

activities or when such activities might impact wetland areas. Such consultations are designed to determine if any wetlands will be affected by proposed actions.

Food Security Act. The Wetland Conservation provision (Swampbuster) of the 1985 (16 U.S.C. 38013862), 1990 (as amended by PL 101-624), and 1996 (as amended by PL 104-127) Food Security Act 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 five 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. Natural Resources Conservation Service (NRCS) is responsible for certifying wetland determinations according to this Act.

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

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

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

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

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

WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. All pesticides used by WS are regulated by the EPA through FIFRA, the Ohio Department of Environmental Protection, by MOUs with land managing agencies, and by WS Directives. Wildlife Services follows standard operating procedure and minimization measures that ensure chemical methods are selective to target individuals or populations, and such use has negligible impacts on the environment. The WS operational program properly disposes of any excess solid or hazardous waste. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. In contrast, the proposed action may benefit minority or low-income populations by reducing mammal damage such as threats to public health and safety.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045). Children may suffer disproportionately from environmental health and safety risks for many reasons, including their developmental, physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed mammal damage management program would only occur by using legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360). This law places administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration.

Controlled Substances Act of 1970 (21 U.S.C. 821 et seq.). This law requires an individual or agency to have a special registration number from the federal Drug Enforcement Administration (DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA). The AMDUCA and its implementing regulations (21 CFR Part 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in rabies 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 the proposed action. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (i.e., a period of time after a drug is administered that must lapse before an animal may be used for food) for specific drugs. Animals that might be consumed by a human

within the withdrawal period must be identified. WS establishes procedures in each state for administering drugs used in wildlife capture and handling that must be approved by state veterinary authorities in order to comply with this law.

Airborne Hunting Act

The Airborne Hunting Act, passed in 1971 (Public Law 92-159), and amended in 1972 (Public Law 92502) added to the Fish and Wildlife Act of 1956 as a new section (16 USC 742j-l) that prohibits shooting or attempting to shoot, harassing, capturing or killing any bird, fish, or other animal from aircraft except for certain specified reasons. Under exception [16 USC 742j-l, (b)(1)], state and federal agencies are allowed to protect or aid in the protection of land, water, wildlife, livestock, domesticated animals, human life, or crops using aircraft.

CHAPTER 2: DEVELOPMENT OF ALTERNATIVES

Chapter 2 contains a discussion of the issues that have driven the development of standard operating procedures and alternatives to address mammal damage. This chapter also contains a description of the Integrated Wildlife Damage Management (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. Chapter 2 also discusses alternatives considered but not analyzed in detail, with rationale.

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

The analysis for magnitude of impact on 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 legal status. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are

based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. WS' removal is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause adverse impacts to the viability of native species populations. All lethal removal of mammals by WS would occur at the requests of a cooperator seeking assistance and only after authorization has been provided by the MDIFW for the lethal take, when required.

In addition, many of the mammal species addressed in this EA can be harvested during annual hunting and/or trapping seasons and can be addressed using available methods by other entities when those species cause damage or pose threats of damage when permitted by the MDIFW. 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 on Nontarget Wildlife Species Populations, Including T&E Species

The issue of nontarget species effects, including effects on T&E species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill nontarget wildlife. Concerns have also been raised about the potential for adverse effects to occur to nontarget wildlife from the use of chemical methods. Chemical methods being considered for use to manage damage and threats associated with mammals are further discussed in Appendix B.

The ESA is a federal legislation that makes it illegal for any person to '*take*' any listed endangered or threatened species or their critical habitat except through permit. 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 threatened or endangered 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 endangered or threatened species or their critical habitat pursuant to Section 7(a)(2) of the ESA.

At the state level, the MDIFW Endangered Species Program protects animal species listed as threatened or endangered in Maine (see Appendix D). This list includes all species listed under the ESA that occur in Maine, as well as other species that were once more prevalent in Maine. The MDIFW issues limited permits for harassment and incidental take of listed species for the purposes of research and protection of property, human safety, and agriculture.

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 Methods on Human Health and Safety

An additional issue often raised is the potential risk to human safety associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse effects on human health and safety. WS' employees use and recommend only those methods which are legally available, selective for target species, and are effective at resolving the damage associated with wildlife. Still, some concerns exist regarding the safety of WS' methods despite their legality. As a result, WS will analyze the potential for proposed methods that pose a risk to members of the public or employees of WS. WS' employees are potentially exposed to damage management methods as well as subject to workplace accidents. Selection of methods, as part of an integrated approach, includes consideration for public and employee safety.

Safety of Chemical Methods Employed

The issue of using chemical methods as part of managing damage associated with wildlife relates to the potential for human exposure, either through direct contact with the chemical or exposure to the chemical, or from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods would include immobilizing drugs, euthanasia drugs, reproductive inhibitors, fumigants, toxicants, and repellents. These methods are further discussed in Appendix B.

The issue of the potential for drugs used in animal capture, handling, and euthanasia to cause adverse health effects in humans that hunt and consume the species involved has been raised. This issue is expected to only be of concern for wildlife which are hunted and sometimes consumed by people as food. All harvestable wildlife that has been exposed to drugs by WS will be properly marked with instruction to "do not eat." Chemicals proposed for use under the relevant alternatives are regulated by the EPA through FIFRA, by state laws, the DEA, the FDA, and WS' Directives.

Safety of Non-Chemical Methods Employed

Non-chemical methods employed to reduce damage and threats to safety caused by mammals, if misused, could potentially be hazardous to human safety. Non-chemical methods may include but are not limited to firearms, live-traps, exclusion, body-gripping traps, pyrotechnics, and other scaring devices. A complete list of non-chemical methods available to alleviate damage associated with mammals is provided in Appendix B of this EA. 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 or nontargets associated with the use of those methods.

Issue 4 – Humaneness and Animal Welfare Concerns of Methods

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 American Veterinary Medical Association (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 (AVMA 2013, California Department of Fish and Game 1991). The AVMA defines pain as being, "*that sensation* (perception) *that results from nerve impulses reaching the cerebral cortex via ascending neural pathways*" (AVMA 2013). The key component of this definition is the perception of pain. The AVMA (2013) notes that "pain" should not be used for stimuli, receptors, reflexes, or pathways because these factors may be active without pain perception. For pain to be experienced, the cerebral cortex and subcortical structures must be functional. If the cerebral cortex is nonfunctional because of tissue destruction, 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, pets, 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 damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and when a *Work Initiation Document for Wildlife Damage Management* or other comparable instruments provide for direct damage management by WS. The initial investigation defines the nature, history, and extent of the problem, species responsible for the damage, and methods available to resolve the problem. The professional skills of WS personnel are often required to effectively resolve problems, especially if restricted-use pesticides are necessary or if the problems are complex.

Technical Assistance Recommendations

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

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

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 to producers, homeowners, state and county agents, colleges and universities, and other interested groups related to wildlife damage management and disease issues. 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 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 non-lethal methods and found them to be impractical, too costly, or inadequate to reduce damage. WS personnel assess the problem then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documentation process, but a mental problem-solving process common to most, if not all, professions.

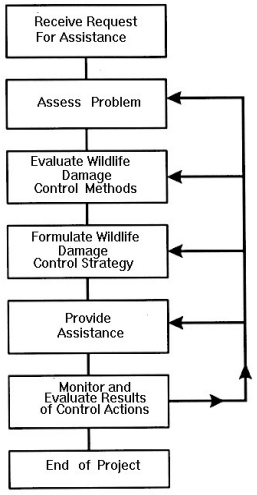

Figure 2.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

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 non-lethal and lethal methods depending on the alternative selected. WS and other state, tribal and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available.

Requests for assistance to manage damage caused by mammals often originate from the requesting decisionmaker(s) based on community feedback or from concerns about damage or threats to human health and 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 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

SOPs improve the safety, selectivity, and efficacy of wildlife damage management activities. The WS program uses many such SOPs. Those SOPs would be incorporated into activities conducted by WS when addressing mammal damage and threats.

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

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

- WS' employees that use controlled substances would be trained to use each material and are certified to use controlled substances.

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

- 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.

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 take of mammals by WS would be reported and monitored by WS and the MDIFW to help evaluate population trends and the magnitude of WS' take of mammals and ensure activities do not adversely affect mammal populations.

- The take of mammals under the alternatives would only occur under conditions permitted by the MDIFW, USFWS, and local ordinances when applicable, and only at levels authorized.

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

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

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

- As appropriate, suppressed firearms would be used to minimize noise impacts.

- Personnel would be present during the use of live-capture methods or live-traps would be checked at least every 24 hours to ensure nontarget and T&E species are released immediately or are prevented from being captured.

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

- Nontarget animals captured in traps would be released unless it is determined by WS that the animal would not survive and/or that the animal cannot be released safely. Nontargets captured on airports would be removed from premises regardless of condition to reduce the threat to airport property and human health and safety.

- WS will follow the SOP's of the 2018 Programmatic Biological Opinion on Lynx to minimize possibly capturing a Canada lynx.

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

- As appropriate, 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).

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

- Trapping would be conducted in areas of low human activity when appropriate and personnel involved in trapping activities will be fully trained in the proper and safe application of this method. As appropriate, WS would use signage and other means of notification to ensure the public is aware of trapping applications or applications sites.

- 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, MDIFW, 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 instruction and other applicable laws and regulations, and Executive Order 12898.

Issue 4 – Humaneness and Animal Welfare Concerns of Methods

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

- WS' use of euthanasia methods would follow those recommended by WS' Directives (WS Directive 2.505, WS Directive 2.430) and AVMA guidelines (AVMA 2013).

- WS' use of all traps, cable restraints, and other capture devices would comply with WS Directive 2.450 and WS MOU with MDIFW.

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

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

The no action/proposed action alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by mammals. WS, in consultation with the MDIFW, would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding is available, operational damage management. Funding could occur through federal appropriations or from cooperative funding.

The adaptive approach to managing damage associated with mammals would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by site-specific evaluation to reduce damage or threats to human safety for each request. City/town managers, agricultural producers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. WS would work with those persons experiencing mammal damage in addressing those mammals responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as mammals begin to cause damage. Mammal damage that has been ongoing can be difficult to resolve using available methods since mammals could be conditioned to an area and are familiar with a particular location. Subsequently, making that area unattractive through the use of available methods can be difficult to achieve once damage has been ongoing. WS would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

Under this alternative, WS would respond to requests for assistance by: 1) taking no action if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by mammals, or 3) provide technical assistance and direct operational assistance to a property owner or manager experiencing damage. The removal of mammal species native to Maine or designated game species can only legally occur through regulated hunting and trapping seasons or through the issuance of a permit or license by MDIFW and only at levels specified in the permit. Activities conducted under this alternative would occur in compliance and in coordination with the MDIFW.

Property owners or managers requesting assistance would be provided with information regarding the use of effective and practical non-lethal 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 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.

Mammals could be euthanized by close range gunshot, which is a method of euthanasia considered appropriate by the AVMA for free-ranging wildlife, when administered appropriately (AVMA 2013). On occasion, euthanasia of live-captured mammals would occur through the use of euthanasia drugs or carbon dioxide once the animal was captured using other methods. Euthanasia drugs are an acceptable form of euthanasia for free-ranging wildlife while carbon dioxide is a conditionally acceptable[6] method of euthanasia (AVMA 2013).

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

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

Lethal methods would be employed to resolve damage associated with those mammal species identified by WS as responsible for causing damage or threats to property, agricultural resources, natural resources, and human health and safety only after receiving a request for the use of those methods. The use of lethal

[6] The AVMA (2013) defines conditional acceptable as "...[methods] *that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature".*

methods may result in local population reductions in the area where damage or threats were occurring since mammals would be removed from the population. Lethal methods are often employed to reinforce non-lethal methods and to remove mammals that have been identified as causing damage or posing a threat to cause damage. 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, whether negative impacts are sufficiently reduced to protect property or human health and safety, and the efficacy of methods employed.

WS may recommend mammals be harvested during the regulated hunting and/or trapping season for those species in an attempt to reduce the number of mammals causing damage. Managing mammal populations over broad areas could lead to a decrease in the number of mammals causing damage, however population management is not the goal of WS' technical assistance or direct operational assistance. Establishing hunting or trapping seasons and managing wildlife populations is the responsibility of the MDIFW. WS' main responsibility focuses on wildlife damage management. Additionally, WS will comply with all permitting required to carry out the work involved.

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

Under this alternative, WS would be restricted to only using or recommending non-lethal methods to resolve damage caused by mammals (Appendix B). These non-lethal methods include exclusion, habitat management, animal behavioral modifications (*e.g.* human effigies, harassment), live-capture, and translocation. In situations where non-lethal methods are impractical or ineffective to alleviate damage, WS could refer requests for information regarding lethal methods to the MDIFW, local animal control agencies, or private businesses or organizations. Property owners or managers might choose to implement WS' non-lethal recommendations on their own or with the assistance of WS, implement lethal methods on their own, or request assistance (non-lethal or lethal) from a private or public entity other than WS.

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 MDIFW and/or other 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 MDIFW, when required, and during the hunting or trapping seasons for regulated game species. All methods described in Appendix B would be available for use by those persons experiencing damage or threats except for the use of immobilizing drugs and euthanasia chemicals. Immobilizing drugs and euthanasia chemicals can only be used by WS or appropriately licensed veterinarians.

2.6 ALTERNATIVES CONSIDERED BUT NOT ANALYZED 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:

All Non-lethal Methods Implemented Before Lethal Methods

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

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

Use of Lethal Methods Only by WS

This alternative would require the use of lethal methods only to reduce threats and damage associated with mammals. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. Non-lethal methods have been effective in alleviating mammal damage. In those situations where damage could be alleviated using non-lethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. Therefore, this alternative was not considered in detail.

Trap and Translocate Mammals Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Mammals would be live-captured using immobilizing drugs, live-traps, 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 MDIFW and the property owner where the translocated mammals would be placed prior to live-capture and translocation. Live-capture and translocation could be conducted as part of the alternatives analyzed in detail. When requested by the MDIFW, WS could translocate mammals or recommend translocation under any of the alternatives analyzed in detail, except under the no involvement by WS alternative (Alternative 3). Since WS does not have the authority to translocate mammals unless permitted by the MDIFW, this alternative was not analyzed in detail. In addition, the translocation of mammals by WS could occur under any of the alternatives analyzed in detail, except Alternative 3. However, translocation by other entities could occur under Alternative 3.

The translocation of mammals that have caused damage to other areas following live-capture generally would not be effective or cost-effective (Beringer et al. 2002). Translocation is generally ineffective because problem mammal species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and translocation would most likely result in mammal damage problems at the new location. In a study in north-central Illinois, raccoons were trapped and relocated, then monitored (Mosillo et al. 1999). The study found that translocated raccoons left the release site very quickly (hours to days) and dispersed into the surrounding environment. Many of them denned near human residences after dispersal, potentially creating new conflicts with landowners. Also, hundreds of mammals would need to be captured and translocated to solve some damage problems; therefore, translocation would be unrealistic.

Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of the stress to the translocated animal, poor survival rates, and the difficulties that translocated wildlife have with adapting to new locations or habitats (Nielsen 1988). There is also a concern of spreading wildlife diseases by moving wildlife from one location to another.

WS Would Use Reproductive Control to Reduce Populations of Wild Mammals in the State that are Causing Damage

Under this alternative, the only method available by WS for recommendation or use in resolving damage or threats associated with wild mammals would be reproductive control. Reproductive control for wildlife can be accomplished either through sterilization (permanent) or contraception (reversible). 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.), the nature of the local environment (e.g., isolation of target population, access to target individuals, etc.), and other biological factors. In general, if the time needed to reduce damage is a factor in selecting a management method, lethal control will always be more efficient than reproductive control because reproductive control cannot generate a more rapid population decline (Bradford and Hobbs 2008, McLeod and Sanders 2014).

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. However, GonaCon™ is not currently registered for use in Maine.

Trap-Neuter-Release Program for Feral and Free-Ranging (Domestic) Cats

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

Theoretically, TNR would work if all animals of one sex or both were sterilized. However, the probability of controlling free-ranging/feral cat breeds in the wild with this technique is not currently reasonable, especially since many animals are self-sufficient and do not rely on humans to survive. There is also a chance of natural or artificial immigration to occur with cats that can help sustain the population. In addition, some individuals within a population can be trap-shy. Capturing or removing trap-shy individuals often requires implementing other methods.

Of major concern are the potential for diseases and parasites to be transmitted to humans either via direct contact during sterilization or the risk of exposure after the animal is released. Once live-captured, performing sterilization procedures during field operations on anesthetized feral cats would be difficult. Sanitary conditions are difficult to maintain when performing surgical procedures in field conditions. To perform operations under appropriate conditions, live-captured animals would need to be transported from the capture site to an appropriate facility, which increases the threat from handling and transporting. A mobile facility could be used but would still require additional handling and transporting of the live-captured animals to the facility. Once the surgical procedure was completed, the animal would have to be held to ensure recovery and transported back to the area where capture occurred. These surgical field operations are not within the level of expertise for WS, hence rendering TNR programs to be considered an unreasonable damage management strategy.

Furthermore, TNR programs are often not as successful as desired and needed to reduce immediate threats posed by wildlife, especially when human safety is a concern (Barrows 2004, Levy and Crawford 2004, Jessup 2004, Winter 2004). Animals subjected to TNR would continue to cause the same problems[7] they caused before the TNR program was initiated because of slow attrition. TNR programs can take a decade or longer to reduce target species populations (Barrows 2004, Winter 2004) especially when acute issues need rapid solutions (Levy and Crawford 2004, Stoskopf and Nutter 2004). Several studies report that target species populations often remain stable or increase following TNR programs due to immigration and reproduction from other members of the groups (Castillo and Clarke 2003, Levy and Crawford 2004, Winter 2004) with little to no resolution of threats to human safety or damages (Barrows 2004, Slater 2004, Winter 2004).

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

Compensation for Mammal Damage Only

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. 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.

- Based on historical instances, compensation would most likely be less than full market value.

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

- 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 alternative was eliminated from further analysis because it is not financially feasible or practical to provide compensation for all mammal damage.

Bounties

Payment of funds (bounties) for killing some mammals suspected of causing economic losses have not been supported by Maine state agencies, such as MDIFW, as well as most wildlife professionals for many years (Latham 1960, Hoagland 1993). WS concurs with MDIFW 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.

Technical Assistance Only

This alternative would restrict WS to only providing technical assistance (advice) on MDM. Producers, property owners, agency personnel, or others could obtain permits from the MDIFW as needed and could conduct mammal damage management using any of the legally available nonlethal and lethal techniques. Technical assistance information is also readily available from entities other than WS such as the USFWS, universities, extension agents, FAA, and private individual and organizations. Consequently, environmental impacts of this alternative are likely to be similar to Alternative 3 – No WS Mammal Damage Management Program. Consequently, the agencies have determined that detailed analysis of this alternative would not contribute substantive new information to the understanding of environmental impacts of damage management alternatives and have chosen to not analyze this alternative in detail.

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.

<u>Environmental consequences can be direct, indirect, and cumulative.</u>

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 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

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.

Issue 1: Effects of Damage Management on Populations of Target Mammal Species Alternative 1 - Continue the Current Adaptive Integrated Mammal Damage Management Program (No Action/Proposed Action)

A common issue is whether damage management actions would adversely affect the populations of target mammal species, especially when lethal methods are employed. Alternative 1 addresses requests for assistance received by WS through technical and direct operational assistance where an integrated approach to methods would be employed and/or recommended. Non-lethal methods can disperse or otherwise make an area unattractive to mammals causing damage; thereby, reducing the presence of mammals at the site and potentially the immediate area around the site where non-lethal methods are employed.

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

The use of IWDM approved lethal methods, listed in Appendix B, could result in local population reductions in the area where damage or threats were occurring since mammals would be removed from the population. 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 (*i.e.,* the number of animals that WS believes necessary to effectively and measurably reduce damage), the number approved by the regulatory agency that manages the species in question, and the efficacy of methods employed.

WS may recommend mammals be harvested during the regulated hunting and/or trapping season for those species in an attempt to reduce the number of mammals causing damage. Managing mammal populations over broad areas could lead to a decrease in the number of mammals causing damage. Establishing hunting and trapping seasons and the allowed harvest during those seasons is the responsibility of the MDIFW. WS does not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons. However, the harvest of those mammals with hunting and/or trapping seasons would be occurring in addition to any lethal removal that could occur by WS under the alternatives or recommended by WS.

Generally, WS only conducts damage management on species whose populations at the state level are high or are concentrated at the local level and usually only after they have caused damage. Table 3.1 identifies average annual lethal removal of animals by WS, proposed maximum annual WS removal, estimated annual harvest by hunters and trappers (between 2013-2017 as reported by MDIFW, Table 3.2), and the percent of WS proposed removal compared to the average annual harvest estimates. No indirect effects were identified for this issue.

Table 3.1 Quantitative impacts of lethal removal for selected species in Maine.

Species	Average Annual WS Removal 2013-2017	Maximum Proposed WS Annual Removal	ME Statewide Population Trend	ME Statewide Average Annual Estimated Season Harvest 2012/2013-2016/2017	% WS Proposed Annual Removal Compared to Average Annual Harvest
bear, black	0	20	Increasing	3,033	0.66
beaver	498	1,000	Increasing	5,740	17
bobcats	0	10	Stable	176	5.7
cats, feral	0	50	n/a	n/a	n/a
chipmunk, eastern	13	175	n/a	n/a	n/a
cottontail, eastern	0	50	Increasing	n/a	n/a
cottontail, New England	0	0	Decreasing	n/a	n/a
coyotes	2	200	Stable	1,187	17
deer, fallow	0.2	50	n/a	n/a	n/a
deer, red	0.2	50	n/a	n/a	n/a
deer, sika	0	50	n/a	n/a	n/a
deer, white-tailed	1.4	50	Stable	23,512	0.2
dog, feral	0	5	n/a	n/a	n/a
fisher	0	10	Variable	628	1.6
fox, gray	12.6	40	Stable	325	3.8
fox, red	14	50	Stable	577	8.6
hare, snowshoe	0.4	25	Stable	n/a	n/a
lemming, southern bog	0	n/a	n/a	n/a	n/a
marten, pine	0	10	Variable	1482	0.67
mink	0	40	Stable	1245	3.2
mole, hairy-tailed	0	n/a	n/a	n/a	n/a
mole, star-nosed	0	n/a	n/a	n/a	n/a
moose	0	5	Variable	1,609	0.3
mouse, deer	4.2	n/a	n/a	n/a	n/a
mouse, house	0	n/a	n/a	n/a	n/a
mouse, meadow jumping	0	n/a	n/a	n/a	n/a
mouse, white-footed	0	n/a	n/a	n/a	n/a
mouse, woodland jumping	0	n/a	n/a	n/a	n/a
muskrat	0.4	25	Stable	n/a	n/a
opossum, Virginia	10.6	100	Increasing	n/a	n/a
otter, river	0.2	10	Stable	430	2.3
pig, feral	0	200	Variable	n/a	n/a
porcupine	14.8	50	Stable	n/a	n/a
raccoons	56	300	Stable	n/a	n/a
rat, Norway	0	n/a	n/a	n/a	n/a
shrew, masked	0.2*	n/a	n/a	n/a	n/a
shrew, northern short-tailed	0.2*	n/a	n/a	n/a	n/a
shrew, smoky	0.2*	n/a	n/a	n/a	n/a
shrew, water	0.2*	n/a	n/a	n/a	n/a
skunk, striped	18.4	100	Stable	n/a	n/a
squirrel, gray	0.4	50	Stable	n/a	n/a
squirrel, northern flying	0	10	Stable	n/a	n/a
squirrel, red	1.2	50	Stable	n/a	n/a
vole, meadow	*4.8**	n/a	n/a	n/a	n/a
vole, woodland	*4.8**	n/a	n/a	n/a	n/a
southern red-backed vole	*4.8**	n/a	n/a	n/a	n/a
weasel, long-tailed	1*	20	n/a	n/a	n/a
weasel, short-tailed	1*	20	n/a	n/a	n/a
woodchuck	18.6	150	Stable	n/a	n/a

Table 3.2 - Maine Furbearer Harvest for the 2013 to 2017 Seasons (MDIFW 2018)*

SPECIES	2016-17	2015-16	2014-15	2013-14	2012-13
Beaver	3267	4953	3578	7841	9063
Bobcat	190	236	126	124	205
Coyote	878	1281	868	1237	1670
Fisher	329	302	653	617	1242
Red Fox	407	575	269	642	991
Grey Fox	140	287	496	279	426
Pine Marten	1084	380	1145	996	3805
Mink	454	1148	1041	1398	2184
Otter	296	486	261	464	646
Black Bear	2859	3016	3238	2845	3207

*Estimated based on trapping license sales and trapper survey information

Small Mammal (Rodent)

Occasionally, WS conducts small mammal trapping at airports in Maine to reduce the prey base for raptors that may collide with aircraft. WS personnel are trained and experienced in the identification of damage, the identification of animals responsible for the damage, and the identification of individual animals. If species of small mammals listed by the USFWS under the ESA or by the MDIFW were identified, WS would consult with the appropriate entity to determine an appropriate course of action. WS could lethally remove up to 1,000 small mammals annually, of any species composition, consisting of masked shrew, water shrew, smoky shrew, northern short-tailed shrew, hairy tailed mole, star-nosed mole, deer mouse, white-footed mouse, house mouse, meadow jumping mouse, woodland jumping mouse, southern red-backed vole, meadow vole, woodland vole, southern bog lemming, and Norway rat. All of these species are listed as common, except for the smoky shrew which is found statewide, but is classified as uncommon (ASM 2011). Lethal take of these species by WS would be very limited, and will not have any significant impact on the populations.

The house mouse and Norway rat are non-native to North America. Executive Order 13112 Invasive Species directs federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health. Although removal of these species up to and including extirpation could be seen as desirable, because of the productivity and distribution of these species and the limited nature of WS work, WS is unlikely to ever do more than limit populations at the specific local sites where WS works. Any take of these species would be considered beneficial to the environment.

Direct, Indirect, and Cumulative Effects:
Between 2013 and 2017, an annual average of 4.2 deer mice, 0.2 shrew species, and 4.8 vole species were lethally removed during MDM at airports. No other small mammals were taken during this time. Due to their high reproductive rates and because management activities would be localized, the lethal removal of up to 1,000 small mammals annually to manage damage or threats is not expected to have any significant adverse impact on small mammal populations.

Eastern Chipmunk

The eastern chipmunk ranges in the north from Saskatchewan to Quebec, and south from Louisiana to Georgia, and is found commonly throughout its range. It uses a variety of habitats including open deciduous forest with thick understory, rocky ledges with brushy cover, loose stone walls in rocky hillsides, forests without understory, old farm woodlots, cutover land, old buildings, parks, and gardens (Godin 1977). Chipmunks live mostly on and under the ground surface. Chipmunks consume seeds, nuts, berries, mushrooms, insects, and carrion and are well known for their caching behavior, and often climb trees to reach mast. Chipmunks also prey on small birds and bird eggs (Williams and Corrigan 1994), and have been identified as an important nest predator (Reitsma et al. 1990).

Eastern chipmunks breed twice a year, once in the spring and once in the summer, commonly giving birth to four or five young per litter (Godin 1977). Eastern chipmunk density was calculated to be 5.5/ha in forest fragments (Nupp and Swihart 1998).

Population estimates for eastern chipmunks in Maine are currently not available. To analyze potential impacts of WS' activities on eastern chipmunk populations in Maine, the best available information will be used to estimate a statewide population. The land area of the State of Maine (excluding water) is 30,843 mi^2 (United States Census Bureau 2010). If only 25% of the land in Maine is sufficient habitat to support eastern chipmunks, and using an average reported estimate of chipmunk density of 5.5/ha, a conservative statewide eastern chipmunk population could be estimated at approximately 11 million chipmunks. Considering eastern chipmunks are likely to inhabit more than 25% of the state, an estimate of 11 million eastern chipmunks is likely low.

Eastern chipmunks are classified as a "home and garden" damage species by MDIFW, and when involved in property or agricultural damage, a landowner or their agent may kill or have killed those eastern chipmunks causing damage or posing a threat of damage (12MRSA §12401 and §12402) without permission from a game warden or regional wildlife biologist. Between 2013 and 2017, WS has employed lethal methods to remove an average of 13 chipmunks annually during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
In addition to causing damage to agricultural resources, property, and posing threats to human health and safety, eastern chipmunks are also responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 75 eastern chipmunks annually (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of eastern chipmunks by WS, including eastern chipmunks that could be taken to alleviate nest predation, would not exceed 175 eastern chipmunks annually during all damage management activities, statewide. To ensure a cumulative analysis of the potential take of eastern chipmunks to reduce threats to agriculture, property, natural resources, and human health and safety, this EA will evaluate the lethal take of up to 175 eastern chipmunks annually.

Based on a population estimated at 11 million chipmunks, take of up to 175 chipmunks annually by WS would represent 0.001% of the estimated population. The number of chipmunks lethally removed annually by other entities to alleviate damage is unknown; however, take by other entities to alleviate damage caused by chipmunks is not likely to reach a magnitude where adverse effects would occur to the statewide population. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Eastern Cottontail

The eastern cottontail is abundant and widespread across the Eastern U.S., occurring almost anywhere there is suitable habitat (Craven 1994). Cottontails do not distribute themselves evenly across the landscape, but tend to concentrate in favorable habitats such as brushy fence rows or field edges, gullies filled with debris, brush piles, areas of dense briars, or landscaped backyards where food and cover are suitable. Cottontails are rarely found in dense forest or open grasslands, but fallow crop fields may provide suitable habitat. Within these habitats, cottontails spend their entire lives in an area of 10 acres or less. Occasionally they may move a mile or so from a summer range to winter cover or to a new food supply. In suburban areas, cottontails are numerous and mobile enough to fill voids when cottontails are removed from an area. Population densities vary with habitat quality, but one cottontail per 0.4 hectares (1 acre) is a reasonable average (Craven 1994). Cottontails live only 12 to 15 months, yet make the most of time available reproductively. They can raise as many as six litters per year of one to nine young (usually four to six), having a gestation period of 28 to 32 days. If no young were lost, a single pair together with their offspring could produce five million cottontails in five years (Sullivan and Hilbert 2014).

Eastern cottontails are non-native to Maine, and until very recently, did not exist in the State. The Maine Department of Inland Fisheries and Wildlife (MDIFW) confirmed the presence of eastern cottontails on Badger's Island in Kittery, as well as on the mainland in 2017 and 2018 (Kirk Michaud, pers. Comm. 2018). Eastern cottontails are a non-native species that can pose a threat to our native cottontail, the New England cottontail (Fuller and Tur 2012). The New England cottontail is currently a State Endangered species that inhabits Southern Maine. The population of eastern cottontails found on Badger's Island in 2017 is the first confirmed population of the species in Maine. Currently, WS has been coordinating with regional groups/agencies to erect travel barriers to prevent Eastern cottontails from crossing bridges that would allow passage from New Hampshire to Maine.

Eastern cottontails look very similar to New England cottontails with the same shorter ears, feet and face, although Eastern cottontails have a distinctive white patch on their forehead. Unlike Maine's other native "rabbit" the snowshoe hare, the eastern cottontail will stay brown all year long. Eastern cottontails tend to occur in residential areas, including lawns, where both of the other native rabbits are unlikely to be.

Direct, Indirect, and Cumulative Effects:
To reduce the threat that eastern cottontail rabbits pose to the endangered New England cottontail, WS may be requested to assist with removal of eastern cottontail rabbits in Maine. WS anticipates a potential need of removing up to 100 eastern cottontails annually in the future. Additionally, the cottontail's ability to reproduce frequently allows for up to 85% of the annual population to die without negative effects (Sullivan and Hilbert 2014). Based on the best scientific data, WS proposed take level will have no adverse direct or cumulative effects on cottontail populations.

New England Cottontail

The New England cottontail is state listed as an endangered species in Maine and can be found in the southern portion of Maine, limited to York and Cumberland Counties (Todd, MDIFW, Pers. Comm., 2013). New England cottontails utilize specific habitat types including shrub lands, thickets, and early-successional forests. Microhabitats containing more than 20,000 stem cover units per acre are preferred by this species (USFWS and NRCS 2011). Breeding occurs from March into September, during which time, several litters can be produced. Four weeks after breeding, the mother gives birth to up to five young. After two weeks, the young disperse, and have an average life span of 15 months (Wildlife Management Institute 2012).

Recently, the New England cottontail (NEC) has declined substantially and occupied patches have become increasingly separated. Litvaitis et al. (2003) reported a decline of 75 percent between 1960 and 2002 in the region occupied by the cottontail. Recent surveys indicate a further decline for the species. Surveys in 2008 documented a presence in 7 of the 23 New Hampshire locations that were known to be occupied in 2002 and 2003. Similarly, surveys in Maine found cottontails present in 12 of 57 sites identified in 2000 to 2004. Genetic diversity and effective population sizes have also been substantially reduced in Maine and elsewhere. Kovach and Fenderson (2010) believe that the Maine/New Hampshire cottontail populations are at risk of extinction because of the significant range contraction in both states since the early 2000's, reduced effective population sizes that question the short-term persistence of the populations, and lack of connectivity as shown by very limited gene flow among the populations. They have estimated the mean effective population sizes at the three largest sites in Maine to be close to or below 50 individuals, suggesting that the Maine populations are at risk for even short-term persistence.

Direct, Indirect, and Cumulative Effects:
The WS program in Maine has been in collaboration with the USFWS to implement an emergency winter feeding program at several NEC habitat patches to increase the likelihood that cottontails will persist in those patches throughout the winter, and to obtain information to refine supplemental feeding methods. This work will supplement the NEC habitat restoration efforts by maintaining occupied habitat patches that can act as a source population for restored habitat. The tenuous condition of the Maine NEC populations requires that management efforts be focused on sustaining the current populations that could be extirpated by natural stochastic events, specifically winter severity.

WS' specific role in this supplemental feeding program:

1. Placing and maintaining feeding stations at NEC habitat patches in Maine;
2. Re-supplying and monitoring the sites from early winter through spring green up;
3. Monitoring the sites during site visits and through the use of remote cameras;
4. Maintaining the sites at least once a week or by agreement with the USFWS;
5. Relocating feeding stations should they be visited by a predator, as evidenced by remote camera photography or by observation of sign;
6. Alert USFWS and MDIFW to any NEC mortalities found on site, major problems that are encountered, or circumstances that indicated that the supplemental feeding is detrimental to the rabbits;
7. Optional work to collect and preserve rabbit fecal pellets at sites that include feeding stations may be authorized by USFWS.

The tenuous condition of the Maine New England cottontail populations requires that management efforts be focused on sustaining the current populations that could be extirpated by natural stochastic events, specifically winter severity. Winter severity, as measured by snow cover, was identified in several studies as significantly affecting cottontail survival (FR 39395, June 30, 2004). During winters with heavy snowfall, cottontail populations may be significantly reduced because of the increased vulnerability of individuals, due to their limited mobility and access to food. No studies are available to assess supplemental feeding for the NEC; however, two recent studies have been completed that focused on the eastern cottontail and the mountain hare (Newey et al. 2010, Weidman 2010). Both of these studies demonstrated a doubling of winter survival for rabbits fed with feeding stations to supplement their natural winter diet. It is expected that WS' supplemental feeding program will benefit populations of NEC in Maine and likely not to impact them in a negative way. In smaller habitats (5 acres or less), NEC tend to deplete their food resources during the winter and as a result, are forced into areas with less cover that make them more vulnerable to predation (USFWS 2011). WS supplemental feeding would allow NEC to remain in the safety of dense cover to feed during the lean winter months. Establishing and resupplying feeding stations, site monitoring, fecal pellet collection, and checking remote cameras should not negatively impact the NEC. If it was determined that a predator was attracted to a site due to the feeding

program, WS would relocate the site, in coordination with USFWS and MDIFW to alleviate the risk posed to the NEC.

Red Squirrel

Red squirrels range across North America from Quebec to Alaska, to the southern Appalachians of South Carolina and Tennessee, and to the southern Rocky Mountains of New Mexico and Arizona (Godin 1977). Red squirrels are known to be aggressive, unsociable, and territorial when defending food caches (Godin 1977). This squirrel has a wide range of foods that it consumes including seeds, nuts, vegetation, fungi, fruit, insects, meat, and eggs. Many studies have identified the red squirrel as a nest predator (Chalfoun et al 2002, Sieving and Wilson 1998). Red squirrels breed between mid-January and late September. The young are born in the spring or early summer, and a second litter may occur in August or September. There are typically four or five young per litter, and they are weaned after a month of age (Godin 1977).

Red squirrel populations exhibit seasonal, yearly, and regional fluctuations within various habitats with population densities varying widely. Layne (1954) cites population densities ranging from 0.05 squirrels/acre (marginal habitat) to 30/acre from a number of studies in northeast North America. Hamilton (1939) identified the home range of red squirrel at approximately one square acre.

To analyze potential impacts of WS' activities on red squirrel populations in Maine, the best available information has been used to estimate a statewide population. The land area of the state of Maine (excluding water) is 30,843 mi^2 (US Census Bureau 2010). Using the assumption that only 25% of the land in Maine is sufficient habitat to support red squirrels, and using a modest estimate of red squirrel density of 1/acre, a conservative statewide red squirrel population could be estimated at approximately five million red squirrels. Considering red squirrels are likely to inhabit more than 25% of the state, and may exist at much higher densities, an estimate of five million red squirrels is likely low.

There is no closed season for hunting red squirrels in Maine. Red squirrels are classified as a "home and garden" damage species by MDIFW, and when involved in property or agricultural damage, a landowner or their agent may kill or have killed those red squirrels (12MRSA §12401 and §12402) without permission from a game warden or regional wildlife biologist. Between 2013 and 2017, WS has taken an annual average of 1.2 red squirrels as unintentional nontargets in the State during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
Based on previous activities conducted by WS and in anticipation of receiving additional requests for assistance, up to 50 red squirrels could be lethally removed by WS annually to alleviate threats to human health and safety, natural resources, property, and agriculture. Based on a population estimated at five million red squirrels, take of up to 50 red squirrels annually by WS would represent 0.001% of the estimated population. The number of red squirrels lethally removed annually by other entities to alleviate damage is unknown; however, take by other entities to alleviate damage caused by red squirrels is not likely to reach a magnitude where adverse effects would occur to the statewide population. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Gray Squirrel

Gray squirrels are found in forested areas from southern Canada to Florida, and west to Texas (Godin

1977). They inhabit mixed hardwood forests, especially where oak and hickory are found. Squirrels feed on a wide variety of foods, including nuts, seeds, berries, vegetation, tree buds, and fungi (Jackson 1994b).

Gray squirrels den in tree cavities or leaf nest and breed during midwinter and sometimes a second time in May or June. The gestation period is about 44 days. The average litter size is three squirrels and the young are weaned at about eight to ten weeks of age (Godin 1977). Home ranges of squirrels range from 1.2 to over 40 acres in size (Flyger and Gates 1982).

Gray squirrel populations periodically rise and fall, and during periods of high populations they may go on mass emigrations, during which time many animals die. Predation seems to have little effect on squirrel populations. Typically about half the squirrels in a population die each year and wild squirrels over four years old are rare, while captive individuals may live 10 years or more (Jackson 1994b).

Gray squirrel densities fluctuate based on available food sources but long-term densities tend to be stable (Gurnell 1987). In continuous areas of woodlands in North Carolina, gray squirrel densities were typically less than 1.2 squirrels per acre. In urban parks, gray squirrel densities can be more than 8.4 squirrels per acre (Manski et al. 1981).

To analyze potential impacts of WS' activities on gray squirrel populations in Maine, the best available information has been used to estimate a state-wide population. The land area of the state of Maine (excluding water) is 30,843 mi^2 (US Census Bureau 2010). Using the assumption that only 25% of the land in Maine is sufficient habitat to support gray squirrels, under a worst case scenario, with a population density of 1.2 gray squirrels per acre, the gray squirrel population could be estimated to be approximately 5.9 million.

Gray squirrels are classified as a "home and garden" damage species by MDIFW, and when involved in property or agricultural damage, a landowner or their agent may kill or have killed those gray squirrels (12MRSA §12401 and §12402) without permission from a game warden or regional wildlife biologist. Gray squirrels are considered small game by the MDIF&W in Maine with a regulated hunting season with a daily bag limit of four. Information regarding the total number of squirrels killed in Maine annually is not available. Between 2013 and 2017, WS lethally removed an annual average of 0.4 gray squirrels as unintentional nontargets in the State during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
Up to 50 gray squirrels could be lethally removed by WS annually to alleviate threats to human health and safety, natural resources, property, and agriculture. Based on a population estimated at 5.9 million gray squirrels, take of up to 50 gray squirrels annually by WS would represent 0.0008% of the estimated population. The number of gray squirrels lethally removed annually by other entities to alleviate damage is unknown; however, take by other entities to alleviate damage caused by gray squirrels is not likely to reach a magnitude where adverse effects would occur to the statewide population. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Woodchuck

Woodchucks are found throughout Maine preferring habitat that offers open fields, pastures, and woodland edges. Woodchucks can even be found deeper in the forest. Adults rarely move more than a half mile within their home ranges, preferring to stay close to the safety of the burrow. They eat a wide variety of vegetation including green grasses, weed shoots, clover, alfalfa, corn in the milk stage, and a variety of garden vegetables and fruits (Fergus 2001).

The woodchuck has a large range, extending north and northeast from Oklahoma and Alabama, and west across Canada into Alaska. After a 28 day gestation period, females bear young in April and early May. Litters average three to four young. Woodchuck densities vary from area to area, depending on food availability, soil type, hunting pressure and predation. Populations with up to six or seven individuals per acre have been documented. However, a population of four per acre is considered abundant, and the average is probably closer to one per acre of farmland (Fergus 2001).

To analyze potential impacts of WS' activities on woodchuck populations in Maine, the best available information will be used to estimate a state-wide population. There are over 1.6 million acres of currently active farmland in the State of Maine (MDAFRR 2011). Based on Fergus (2001), there may be an average of one woodchuck per acre of farmland. Using a modest estimate of one woodchuck for every acre of farmland, a conservative statewide woodchuck population could be estimated at approximately 1.6 million individuals. Considering woodchucks are likely to inhabit more than the active farmland of the state, and may exist at much higher densities, an estimate of 1.6 million woodchucks is likely low.

Woodchucks have little protection in the state of Maine. There is no closed season for hunting woodchucks in Maine. Woodchucks are classified as "home and garden" damage species by MDIFW, and when involved in property or agricultural damage, a landowner or their agent may kill or have killed those woodchucks (12MRSA §12401 and §12402) without permission from a game warden or regional wildlife biologist. Between 2013 and 2017, WS has employed lethal methods to remove an average of 18.6 woodchucks and 48.2 woodchuck dens annually in the state during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
Up to 150 woodchucks could be lethally removed by WS annually to alleviate threats to human health and safety, natural resources, property, and agriculture. Based on a population estimated at 1.6 million woodchucks, take of up to 150 woodchucks annually by WS would represent 0.009% of the estimated population. The number of woodchucks lethally removed annually by other entities to alleviate damage is unknown; however, take by other entities to alleviate damage caused by woodchucks is not likely to reach a magnitude where adverse effects would occur to the statewide population. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Porcupine

Porcupines range throughout the United States (except for the mid-west and southeast), Canada, Alaska and northern Mexico (Godin 1977). They utilize natural cavities, such as rock caves, hollow logs and trees. They exist in forestlands, deserts, and grasslands. Their diet includes inner tree bark, twigs, buds, leaves, grasses, plants, seeds, roots and berries. Porcupines also feed on shed antlers and the bones of dead animals to obtain sodium and calcium. Porcupines are active in the winter and spend most of their time feeding in trees in winter (Godin 1977).

Males reach sexual maturity at 24 months and females at 12 months and breeding takes place from late September to early November. After a gestation period of about 210 days, only one young is born (Godin 1977). Winter range can be as large as 20 acres, while summer ranges vary from 15 to 65 acres. The average range size in preferred habitat is 45 acres (Fergus 2000).

To analyze potential impacts of WS' activities on porcupine populations in Maine, the best available information will be used to estimate a state-wide population. There are over 17 million acres of forested land in the State of Maine. Using a modest estimate of one porcupine for every 65 acres (the largest summer range), and estimating that half of the forestland is suitable habitat, a conservative statewide porcupine population could be estimated at approximately 130,000 individuals. Considering porcupines

are likely to inhabit more than half of the forested land of the state, and may exist at much higher densities, an estimate of 130,000 porcupines is likely low.

Porcupines have little protection in the state of Maine. There is no closed season for hunting porcupines in Maine. Porcupines are classified as "home and garden" damage species by MDIFW, and when involved in property or agricultural damage, a landowner or their agent may kill or have killed those porcupines (12MRSA §12401 and §12402) without permission from a game warden or regional wildlife biologist. Between 2013 and 2017, WS has employed lethal methods to remove an average of 14.8 porcupines annually in the State during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
Up to 50 porcupines could be lethally removed by WS annually to alleviate threats to human health and safety, natural resources, property, and agriculture. Based on a population estimated at 130,000 porcupines, take of up to 50 porcupines annually by WS would represent 0.04% of the estimated population. The number of porcupines lethally removed annually by other entities to alleviate damage is unknown; however, take by other entities to alleviate damage caused by porcupines is not likely to reach a magnitude where adverse effects would occur to the statewide population. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Beaver

Beavers range throughout North America except for the arctic tundra, peninsular Florida, and the southwestern deserts (Jenkins and Busher 1979). Beavers utilize a variety of aquatic habitats including small streams, rivers, ponds, lakes, and wetlands that are surrounded by forested habitat. The leaves, twigs, and bark of most tree species provide food for beavers. Trees from the aspen and willow genus are preferred over other trees. Woody plants, herbaceous plants, and aquatic vegetation are also an important food source for beavers (Jenkins and Busher 1979). In the majority of habitats, beavers construct a dam to control the water depth and then proceed to build a lodge for safety from the elements. In the winter beaver eat from a food cache of preferred tree species that are stored under the ice (Hilton 1986). An average colony of beavers is comprised of four to eight related individuals. Mating season occurs in January or February and an average of three to four kits is born between April and June. The mother beaver lactates for two to three months. Offspring can become sexually mature at 1.5 years of age and disperse by two years of age (Jenkins and Busher 1979).

Beaver can be found statewide in Maine wherever suitable habitat exists. There has not been an update to the beaver population estimate in the state since the 1986 estimate but beaver populations in the State appear to be increasing, especially as regulated trapping has decreased due to low fur prices (Walter Jakubas, MDIFW, pers. Comm. 2015). The MDIFW, with management authority over beaver, currently allows beavers to be harvested during a regulated season with no limit on the number of beaver that can be harvested (MDIFW 2017). The MDIFW reported that an average of 5,740 beavers were harvested by recreational trappers annually between the 2012/2013 and the 2016/2017 seasons (Table 4.2).

Between 2013 and 2017, WS has employed lethal methods to remove an average of 498 beavers annually during MDM activities (Table 4.1). In addition, WS has captured and relocated an average of 59 beavers annually in the state of Maine between 2013 and 2017.

Direct, Indirect, and Cumulative Effects:
Up to 1,000 beavers could be lethally removed and up to 200 beavers could be live-captured and translocated by WS annually to alleviate threats to human health and safety, natural resources, property, and agriculture. Based on a population estimated at a minimum of 45,000 individuals, take of up to 1,000

beavers annually by WS would represent 2.2% of the estimated population. This level of take by WS would account for 17% of the average number of beavers harvested by recreational trappers each year. Thus, the lethal removal of beaver will not adversely affect the beaver population in Maine and will not limit the ability to harvest beaver in the State during the regulated trapping season. Based on a population estimated at a minimum of 45,000 individuals, translocation of 200 beavers annually by WS would represent 0.4% of the estimated population. However, many of the translocated beavers would be expected to survive. WS consults with MDIFW regional biologists to select suitable translocation areas that would give the beaver a high chance of survival. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Virginia Opossum

Opossums are the only marsupials found north of Mexico (Seidensticker et al. 1987). Opossums inhabit most of the eastern and central United States, west to Wyoming, Colorado, and central New Mexico (National Audubon Society 2000). Opossums are also found in California, Oregon, Washington, and parts of the southwestern United States (Jackson 1994a). Opossums climb very well and eat insects, frogs, birds, snakes, small mammals, earthworms, berries, fruits, and carrion (National Audubon Society 2000).

The reproductive season of the Virginia opossum typically occurs from December to February, depending on latitude (Gardner 1982). The average gestation period is 12.8 days after which one to 17 young are born in an embryonic state. Opossums live for only one to two years, with as few as 8% surviving into the second year (Seidensticker et al. 1987). In a five year study, it was also observed that there was a wide variation in opossum numbers in excellent habitat. Those variations were observed seasonally and in different years. However, the mean density during the study was 3.9/km^2 (2.4/mi^2). This was comparable to other opossum population densities in similar habitats in Virginia (Seidensticker et al. 1987).

Opossums are largely absent in the northern two-thirds of Maine, but are relatively common throughout southern Maine. There is some indication that opossums are slowly expanding their range northward. To analyze potential impacts of WS' activities on Opossum populations in Maine, the best available information will be used to estimate a state-wide population. Knowing that opossums are not located statewide, but that they do exist commonly in southern Maine, and that much of the habitat will occur largely in York, Cumberland, and Sagadahoc counties, we have analyzed the effect of MDM within these three counties. There is 1,894 mi^2 of forestland (Griffith and Alerich 1996) and 73 mi^2 of cropland (USDA 2009) in York, Cumberland and Sagadahoc counties. Using the assumptions that only 75% of the rural lands throughout these counties have sufficient habitat to support opossum, opossum are only found in rural habitat, and opossum densities average 2.4 opossum per mi^2, a three-county opossum population could be estimated at approximately 3,540 opossum. Considering opossum inhabit a large variety of habitats, including urban areas, and occupy more than 75% of the forested and cropland habitat available, an estimate of 3,540 opossum is likely low.

Opossums are classified as a furbearer in Maine with a regulated trapping season with no take limit (MDIFW 2015). There are no tagging requirements for opossums in Maine, and therefore, no harvest information is available. When opossums are involved in property or agricultural damage, a landowner or their agent may kill or have killed those opossums (12MRSA §12401 and §12402). Between 2013 and 2017, WS has employed lethal methods to remove an average of 10.6 opossums annually in the State during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
Opossums are occasionally responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 30 opossum annually (USDA 2012). The cumulative take of opossums by WS, including opossums that could be taken to alleviate nest predation, would not exceed 100 opossums annually during all damage management activities. Based on a population estimated at 3,540 opossums, take of up to 100 opossums annually by WS would represent 2.8% of the estimated population. The number of opossums lethally removed annually by regulated trapping or other entities to alleviate damage is unknown; however, take by other entities to alleviate damage caused by opossums is not likely to reach a magnitude where adverse effects would occur to the statewide population.

Historically, opossums were not known to exist in Maine until recent decades. Due to the fact that opossum are not native to Maine, WS' proposed take could be viewed as beneficial. Some would propose that lowering the population of a non-native species is beneficial to the ecosystem. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Raccoon

The raccoon is omnivorous and feeds on carrion, garbage, birds, mammals, insects, crayfish, mussels, other invertebrates, and a wide variety of grains, various fruits, other plant materials and most or all foods prepared for human or animal consumption (Godin 1977). Raccoons occasionally kill poultry (Boggess 1994).

The raccoon is found throughout most of the U.S., with the exception of the higher elevations of mountainous regions and some areas of the arid southwest (Boggess 1994, National Audubon Society 2000). Raccoons are more common in the wooded eastern portions of the U.S. compared to the more arid western plains (Boggess 1994), and are frequently found in cities or suburbs as well as rural areas (National Audubon Society 2000).

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

The public are also concerned about health and safety issues associated with raccoons. They can transmit pathogens that cause disease such as canine distemper and rabies, and the roundworm *Baylisascaris procyonis*, the eggs of which survive for extremely long periods in raccoon feces and soil contaminated by them. Ingestion of those eggs can result in serious or fatal infections in other animals as well as humans (Davidson and Nettles 1997, see Table 1.1).

WS provides assistance in combating the spread of raccoon rabies in Maine. Those activities are part of the national rabies barrier program covered under separate environmental analyses (USDA 2005). Other rabies monitoring or control activities may occur as part of this program. Raccoons killed under the oral rabies vaccination program are analyzed in the EA and FONSI – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Fox, and Coyotes in the United States (USDA 2005) but are included in this EA for cumulative impact analysis.

Absolute raccoon population densities are difficult or impossible to determine because of the difficulty in knowing what percentage of the population has been counted or estimated and the additional difficulty of knowing how large an area the raccoons are using (Sanderson 1987). Due to their adaptability, raccoon densities reach higher levels in urban areas than that of rural areas. Relative raccoon population densities have been variously inferred by take of animals per unit area. For instance, Twichell and Dill (1949) reported removing 100 raccoons from tree dens in a 41 ha (101 acres) waterfowl refuge area, while Yeager and Rennels (1943) studied raccoons on 881 ha (2,177 acres) in Illinois and reported trapping 35-40 raccoons in 1938-39, 170 in 1939-40, and 60 in 1940-41. Slate (1980) estimated one raccoon/7.8 ha (19.3 acres) in New Jersey in predominantly agricultural land on the inner coastal plain. Raccoon densities of 100 per sq. mile (1 raccoon per 6.4 acres) have been attained around abundant food sources (Kern 2002). Riley et al. (1998) summarized rural raccoon densities based on published literature, which ranged from 2 to 650 per sq. mile in rural habitats with an average of 10 to 80 raccoons per sq. mile. This species is considered widespread and very common throughout most of the state of Maine. In 1985, the raccoon population in Maine was estimated at 120,700 individuals and was projected to increase to 121,500 by 1990 (Connoly 1986). The MDIFW (Connoly 1986) also noted that the only factor that would limit a stable to increasing raccoon population in Maine was disease.

Raccoons are classified as furbearers in Maine with a regulated hunting and trapping season with unlimited take (MDIFW 2015). There are no tagging requirements for raccoons in Maine, and therefore, no harvest information is available. Raccoons are classified as "home and garden" damage species, and when involved in property or agricultural damage, a landowner or their agent may kill those raccoons (12MRSA §12401 and §12402) without permission from a game warden or regional wildlife biologist. Between 2013 and 2017, WS has employed lethal methods to remove an average of 56 raccoons annually in the State during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
In addition to causing damage to agricultural resources, property, and posing threats to human health and safety, raccoons are also responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 150 raccoons annually (USDA 2012). Raccoons may also be euthanized during projects relating to rabies in the state of Maine. Activities conducted to prevent the further spread of raccoon rabies in the State generally do not result in the lethal take of raccoons. Raccoons are live-captured, sampled, and released on-site as part of the post-baiting protocols. However, if raccoons are visibly injured or exhibit signs of disease, those raccoons are often euthanized. The number of raccoons lethally taken in the State during the post-baiting trapping varies, but is not likely to exceed 50 individuals (USDA 2005). To ensure a cumulative analysis of the potential take of raccoons to reduce threats to agriculture, property, natural resources, and human health and safety, this EA will evaluate the lethal take of up to 300 raccoons annually during all damage management activities.

Using the population estimate in 1990 of 121,500 individuals, WS' lethal take of 300 raccoons would impact 0.25% of the population in Maine. Therefore, WS' lethal removal of 300 raccoons is not likely to adversely impact raccoon populations in Maine and will not limit the ability to harvest raccoons in the State during the regulated trapping season. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Striped Skunk

The striped skunk is common throughout the U.S., except for the arid southwest, and Southern Canada. They are an omnivore which feeds on insects, small mammals, the eggs of ground nesting birds, and amphibians. Striped skunks are typically non-aggressive and will attempt to flee when approached by

humans. However, when provoked, skunks will give a warning and assume a defensive posture prior to discharging their foul-smelling musk (Godin 1977).

Adult skunks begin breeding in late February and yearling females (born in the preceding year) mate in late March. Gestation usually lasts about seven to ten weeks. Litters commonly consist of five to nine young with two litters per year possible. The home range of a striped skunk fluctuates with season, feeding activities, and dispersal (Godin 1977). Skunk densities vary widely according to season, food sources and geographic area. Densities have been reported to range from one skunk per 77 acres (3.21/km^2) to one skunk per 10 acres (24.7/km^2) (Rosatte 1987). In northwestern Ohio, Bailey (1971) documented 12 skunks per square mile (4.6/km^2), and in Ontario, Canada, skunk density ranged between 6.4 and 12.6 skunks per square kilometer (Broadfoot et al. 2001).

Population estimates for striped skunks in Maine are currently not available. Striped skunks can be found in a variety of habitats across Maine, especially those influenced by humans. The skunk population in Maine is thought to be stable (John DePue pers. comm. 2010). To analyze impacts of WS' activities on striped skunk populations in Maine, the best available information will be used. The land area of the state of Maine (excluding water) is 30,843 mi^2 (US Census Bureau 2010). Using the assumption that only 50% of the land in Maine is sufficient habitat to support striped skunks, and using the lowest estimate of skunk density (3.21 skunks/km^2), a conservative statewide striped skunk population could be estimated at approximately 128,077 skunks. Considering skunks are likely to inhabit urban areas at much higher densities, and they may inhabit more than 50% of the land area in Maine, an estimate of 128,077 skunks is likely low.

Striped skunks are classified as a furbearer in Maine with regulated trapping and no take limit (MDIFW 2015). There are no tagging requirements for striped skunks in Maine, and therefore, no harvest information is available. When skunks are involved in property or agricultural damage, a landowner or their agent may kill or have killed those skunks (12MRSA §12401 and §12402). Between 2013 and 2017, WS has employed lethal methods to remove an average of 18.4 skunks annually in the State during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
Skunks are occasionally responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 50 skunks annually (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of skunks by WS, including skunks that could be taken to alleviate nest predation, would not exceed 100 skunks annually during all damage management activities. To ensure a cumulative analysis of the potential take of skunks to reduce threats to agriculture, property, natural resources, and human health and safety, this EA will evaluate the lethal take of up to 100 skunks annually.

Using the population estimate of 128,077 individuals, WS' lethal take of 100 skunks would impact 0.08 % of the population in Maine. Therefore, WS' lethal removal of 100 skunks is not likely to adversely impact skunk populations in Maine. In addition, WS' lethal removal will not limit the ability of those interested to harvest skunks during the regulated harvest season in the State. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Mink

Mink are shoreline dwellers and their one habitat requirement is a permanent water area (stream, river, pond, marsh, swamp, or lake). Mink den in muskrat houses, abandoned burrows, holes, crevices, logjams, or abandoned beaver lodges (Godin 1977). Mink mate in late February through early April with

young being born 30 days after implantation. Mink become sexually mature at 10 months of age and can reproduce for seven years or more. Litters can range in size from one to eight, with an average of four young. Mink are opportunistic carnivores that feed primarily on organisms that are found in or near an aquatic environment (Hunt 1986a).

Population densities for mink vary across their range according to habitat and may be influenced temporally by weather, trapping, and territorial aggression by other mink. The Maine mink population in 1985 was estimated to be 79,900 individuals prior to the harvest season, and projected to decrease slightly to 77,000 in 1990 (Hunt 1986a).

Mink are classified as furbearers in Maine, with a regulated trapping season with unlimited take (MDIFW 2015). When mink are involved in property or agricultural damage, a landowner or their agent may kill or have killed those mink (12MRSA §12401 and §12402). Between 2013 and 2017, the statewide trapper fur harvest of mink in Maine has averaged 1,245 individuals per year (MDIFW 2017) (see Table 4.2). The number of mink lethally taken by entities other than WS in the State to alleviate damage or threats of damage is unknown. WS did not take any mink in the State between 2013 and 2017.

Direct, Indirect, and Cumulative Effects:
In addition to causing damage to agricultural resources, property, and posing threats to human health and safety, mink are also responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 20 mink annually (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of mink by WS, including mink that could be taken to alleviate nest predation, would not exceed 40 mink annually during all damage management activities, state-wide. The take of 40 mink by WS would represent 0.06% of a mink population estimated at 77,000 mink. This would account for 3.2% of the average annual mink harvest during the regulated trapping season. This level of take is not likely to affect mink populations in Maine, nor the ability for trappers to harvest mink during the regulated trapping season. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Feral and Free Ranging Domestic Cats

Feral cats are domesticated cats living in the wild. Free-ranging cats are those cats that are considered to belong to, possessed, or otherwise owned by a person, but are allowed the ability to wander freely within the environment (Fitzwater 1994). Feral cats are typically found in commensal relationships wherever people are found. In some urban and suburban areas, cat populations equal human populations. In many suburban and eastern rural areas, feral cats are the most abundant predators. They are opportunistic predators and scavengers that feed on rodents, rabbits, shrews, moles, birds, insects, reptiles, amphibians, fish, carrion, garbage, vegetation, and leftover pet food (Fitzwater 1994).

Feral cats produce two to 10 kittens during any month of the year. An adult female may produce three litters per year where food and habitat are sufficient. Cats may be active during the day but typically are more active during twilight or night. House cats have been reported to live up to 27 years, but feral cats probably average only three to five years. They are territorial and move within a home range of roughly 4 km^2 (1.5 mi^2). After several generations, feral cats can be considered to be totally wild in habits and temperament (Fitzwater 1994).

Feral and free-ranging domestic cats are exotic species to North America. Exotic species are recognized as one of the most widespread and serious threats to the integrity of native wildlife populations and natural ecosystems. Exotic species present special challenges for wildlife managers because their negative impacts are poorly understood by the general public, many exotic species have become such an

accepted component of the environment that many people regard them as "natural," some exotic species have advocacy groups that promote their continued presence, and few policies and laws deal directly with their control. Perhaps no issue has captured more of the challenges for contemporary wildlife management than the impacts of feral or free-ranging human companion or domestic animals. The domestic cat is the companion animal that recently has attracted the most attention for its impact on wildlife species (The Wildlife Society 2010).

The number of feral and free-ranging cats in Maine is unknown. The lowest estimate of the U.S. feral cat population is 20 million (Cummings 2003). Because feral and free-ranging cats are considered to be a detriment to native wildlife species, removing cats could be considered to have beneficial effects on the environment by eliminating predation and competition from an exotic species. Based upon the above information, WS' capture and relocation of cats would not have negative effects on local or statewide populations of this species in Maine.

WS has not removed any cats in Maine during MDM activities between 2013 and 2017 (Table 4.1). However, eight cats have been captured and transferred custody. During this time, one cat was captured and freed. As a program policy, all cats that are captured during MDM activities are returned to the cat's owner, transported to a local animal shelter, or euthanized. Any MDM involving lethal control actions by WS would only be performed following the Maine animal welfare laws. Maine Revised Statute 17 §1031.1-E states:

Owner or owner's agent:
A person, who owns a cat or dog, or the owner's agent, may kill that owner's cat or dog by shooting it with a firearm if the following conditions are met:

A. The shooting is performed by a person 18 years of age or older using a weapon and ammunition of suitable caliber and other characteristics to produce instantaneous death by a single shot.
B. Death is instantaneous;
C. Maximum precaution is taken to protect the general public, employees and other animals; and
D. Any restraint of the cat or dog during the shooting does not cause undue suffering.

Direct, Indirect, and Cumulative Effects:
In addition to causing damage to property, and posing threats to human health and safety, feral cats are also responsible for predation on threatened and endangered species such as piping plovers, least terns, and New England cottontail rabbits. The Maine Nest Predator EA analyzes the non-lethal capture of 20 feral cats annually. The captured cats would be returned to the owner or taken to an animal shelter for adoption (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of feral cats by WS, including feral cats that could be captured to alleviate nest predation, would not exceed 50 feral cats annually during all damage management activities, state-wide. To ensure a cumulative analysis of the potential take of feral cats to reduce threats to agriculture, property, natural resources, and human health and safety, this EA will evaluate the lethal take of up to 50 feral cats and the non-lethal capture of up to 20 feral cats annually.

In future programs, WS may be requested to address damage being caused by feral cats anywhere in Maine to protect any resource being damaged or threatened. It is possible that WS could kill as many as 50 feral cats each year in MDM programs in Maine. Feral cats would be removed in projects aimed at protecting human safety, valuable wildlife, or captive wildlife. Feral cats are not viewed as furbearers in Maine.

Based upon the above information, WS' limited lethal removal of feral cats would have minimal effects on local or statewide populations of this species in Maine. Any MDM involving lethal control actions by WS would be restricted to isolated individual sites. Some local populations may be temporarily reduced

as a result of MDM projects aimed at reducing damage at a local site. In those cases where feral cats are causing damage or are a nuisance and complete removal of the local population could be achieved, this would be considered a beneficial impact on the human environment since these species are not considered part of the native ecosystem.

Feral Dog

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

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

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

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

Feral dogs are highly adaptable, social carnivores. Gipson (1983) suggested that family groups of feral dogs are more highly organized than previously believed. Pup-rearing may be shared by several members of a pack. Survival of pups born during autumn and winter has been documented, even in areas with harsh winter weather. Dens may be burrows dug in the ground or sheltered spots under abandoned buildings or farm machinery. Feral dogs commonly use former fox or coyote dens (Green and Gipson 1994).

To date, WS in Maine has not had to respond to an incident involving feral dogs, but it is fully possible that this could occur in the future. As a program policy, all dogs that are captured during MDM activities would be returned to the dog's owner, transported to a local animal shelter, or euthanized. Any MDM involving lethal control actions by WS would only be performed following the Maine animal welfare laws. Maine Revised Statute 17 §1031.1-E states:

Owner or owner's agent:

A person, who owns a cat or dog, or the owner's agent, may kill that owner's cat or dog by shooting it with a firearm if the following conditions are met:

A. The shooting is performed by a person 18 years of age or older using a weapon and ammunition of suitable caliber and other characteristics to produce instantaneous death by a single shot.
B. Death is instantaneous;
C. Maximum precaution is taken to protect the general public, employees and other animals; and
D. Any restraint of the cat or dog during the shooting does not cause undue suffering.

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

Feral dogs can spread diseases such as rabies or canine distemper, but can also be responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA includes the nonlethal capture of five feral dogs annually. The captured dogs would be returned to the owner or taken to an animal shelter for adoption (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of feral dogs by WS, including feral dogs that could be captured to alleviate nest predation, would not exceed five feral dogs annually during all damage management activities statewide. To ensure a cumulative analysis of the potential take of feral dogs to reduce threats to agriculture, property, natural resources, and human health and safety, this EA will evaluate the lethal take of up to five feral dogs and the non-lethal capture of up to five feral dogs annually.

Direct, Indirect, and Cumulative Effects:
It is possible that WS could kill as many as five feral dogs each year and non-lethally capture five feral dogs annually in MDM programs in Maine. Feral dogs would be removed in projects aimed at protecting human safety, valuable wildlife, or captive wildlife. When the removal of feral dogs is deemed appropriate to alleviate damage, reduce predation risks, or threats to human health and safety associated with feral dogs, live-capture or lethal methods would be employed. Each and every incident that involves a domestic dog will be handled on a case-by-case basis, with WS relying upon the decisions made by the appropriate regulatory authority (*e.g.*, animal control officer, local police, game warden). If WS is requested to use live-capture techniques and subsequently captures a dog, those dogs captured would be either relinquished to the proper authority on site, or will be transported by WS in appropriate animal transport crates. In cases of overly aggressive dogs, WS would request assistance from local animal control, wardens, and/or police. If WS does perform transportation of dogs, the dogs would be immediately delivered and relinquished to the animal control or pet shelter facility. In cases when the dog owner could be identified, WS would either relinquish the dog to the pet owner or to the responsible authority. The local animal control officer or animal shelter would be responsible for the care and disposition of the dog.

Based upon the above information, WS' limited lethal removal of feral dogs would have minimal effects on local or statewide populations of this species in Maine. Any MDM involving lethal control actions by WS would be restricted to isolated individual sites. Some local populations may be temporarily reduced as a result of MDM projects aimed at reducing damage at a local site. In those cases where feral dogs are causing damage or are a nuisance and complete removal of the local population could be achieved, this would be considered a beneficial impact on the human environment since these species are not considered part of the native ecosystem.

Gray Fox

The gray fox range includes southern Canada and most of the United States, except for portions of the Northwestern United States. The range extends south into Mexico and Central America (Godin 1977). The gray fox prefers hardwood or mixed forests, rough and rocky terrain, swamps, and thickets. This species is a skilled climber that ascends trees in search of prey and to escape predators. The gray fox feeds on mice, voles, other small mammals, birds, insects, fruits, vegetables, and other plant matter (Godin 1977). Grasshoppers and crickets are often a very important part of the diet in late summer and autumn (National Audubon Society 2000).

Gray fox mate from January through May and produce litters of two to seven kits after an average gestation period of 53 days. The kits are raised in a den located in dense cover under logs, rocky outcrops, hollow trees, or brush piles. The male fox helps tend to the young, but only after they are three weeks old. The young are weaned at eight to ten weeks and hunt with the parents at three months of age (Godin 1977). Rabies and distemper are associated with this species (National Audubon Society 2000).

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

Population data for gray fox in Maine is currently not available. To determine an estimated population in Maine, the best available data will be used. In Maine, gray foxes are known to be most abundant in the Southern one-third of the state, however, they have now expanded their range throughout Northern Maine (Shevenell Webb Pers. Comm. 2018). Furthermore, they are considered common in York, Cumberland, and Sagadahoc Counties in Maine (USFWS 2001*a*). Since gray fox are more abundant in the southern portion of Maine, population estimates will be restricted to York, Cumberland, and Sagadahoc Counties. There is 1,894 mi^2 of forestland (Griffith and Alerich 1996) and 73 mi^2 of cropland (USDA 2009) in York, Cumberland, and Sagadahoc counties. Using the assumptions that only 75% of the forest and crop lands throughout these counties have sufficient habitat to support gray fox, that gray fox are only found in these habitats, and gray fox densities average 1.2 gray fox/km^2, a three-county gray fox population could be estimated at approximately 4,573 individuals. Considering gray fox inhabit a large variety of habitats, including suburban areas, and may occupy more than 75% of the forested and cropland habitat available, an estimate of 4,573 gray fox is likely low.

A landowner or their agent may kill or have killed any gray foxes that have damaged property, gardens, or homes (12MRSA §12401 and §12402) after receiving specific permission from a game warden or regional wildlife biologist. Gray fox are classified as furbearers in Maine, with a regulated hunting and trapping season with unlimited take (MDIFW 2015). The annual statewide fur harvest of gray fox in Maine has averaged 325 individuals over the past five years (Table 4.2) (MDIFW 2017). Between 2013 and 2017, WS has employed lethal methods to remove an average of 12.6 gray fox annually in the State during MDM activities (Table 4.1).

Direct, Indirect, and Cumulative Effects:
In addition to causing damage to agricultural resources, property, and posing threats to human health and safety (as a rabies vector), gray fox are also responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 20 gray fox annually (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of gray fox by WS, including gray fox that could be taken to

alleviate nest predation, would not exceed 40 gray fox annually during all damage management activities, statewide. To ensure a cumulative analysis of the potential take of gray fox to reduce threats to agriculture, property, natural resources, and human health and safety, this EA will evaluate the lethal take of up to 40 gray fox annually. Using the population estimate of 4,573, WS' lethal take of 40 gray fox would impact 0.88 % of the Maine population and 3.8% of the average annual harvest by recreational trappers. Thus, the lethal removal of gray fox during MDM activities will not adversely affect the gray fox population in Maine and will not limit the ability to harvest gray fox in the State during the regulated trapping season. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Red Fox

The red fox has a range that is widespread over most of North America with the exception of coastal western Canada, Oregon, California, the Great Plains, and the southwestern desert of the United States (Godin 1977). It has been suggested that climatic factors, interbreeding with the introduced European red fox, extirpation of the gray and red wolf, and clearing of land for agriculture has possibly contributed to the present-day expansion and range of the red fox in North America (Voigt 1987).

The red fox utilizes a wide array of habitat types such as; mixed hardwood forests broken with pasture and farmland, brush land, border habitats, and urban neighborhoods. The red fox is opportunistic, feeding mostly on rabbits, squirrels, woodchucks, mice, bird eggs, insects, and native fruit (Godin 1977). They usually kill animals smaller than a rabbit, although fawns, piglets, goat kids, lambs, and poultry are sometimes taken (Phillips and Schmidt 1994). The red fox is also an efficient scavenger (Voigt 1987).

Red fox mate from January to March and produce litters of one to ten kits after a gestation period of 51 to 53 days. The kits are raised in a den, such as an enlarged woodchuck den, usually in sparse ground cover on a slight rise, with a good view of all approaches (National Audubon Society 2000). Juvenile fox are able to breed before reaching a year old, but in areas of high red fox densities, most yearlings do not produce pups (Voigt 1987). Red fox are generally solitary animals as adults, except when mating (Phillips and Schmidt 1994). Rabies and distemper are associated with this species.

The density of red fox populations is difficult to determine because of the animal's secretive and elusive nature. Estimates are prone to error even in open areas with good visibility. Methods used to estimate numbers have included aerial surveys, questionnaires to rural residents and mail carriers, scent post surveys, intensive ground searches, and indices derived from hunting and trapping harvest (Voigt 1987). In Great Britain, where food is abundant in many urban areas, densities as high as 30 foxes per km^2 (78 / mi^2) have been reported (Harris 1977, MacDonald and Newdick 1982, Harris and Rayner 1986), while in southern Ontario, densities of about one fox per square kilometer (2.6 / mi^2) occur during spring. In small areas of the best habitat, three times as many foxes have been observed (Voigt 1987). However, these densities rarely occur extensively because of the dispersion of unsuitable habitat, high mortality, or the presence of competition such as coyotes (Voigt and Earle 1983). Cyclical changes in fox numbers occur routinely and complicate density estimates as well as management. These cycles can occur because of changes in prey availability, or disease outbreaks among red foxes. For fox populations to remain relatively stable, mortality and reproduction must balance approximately. Home ranges for red foxes in the eastern U.S. are usually from 500 to 2,000 ha. (5 -20 km^2; 1.9 - 7.7mi^2) in rural settings such as farmland (Voigt and Tinline 1980), but such sizes may not apply among fox populations in urban settings. Harrison et al (1989) determined fox home range to average 14.7 km^2 in eastern Maine.

Dispersal serves to equalize fox densities over large areas. Annual harvests in localized areas in one or more years will likely have little impact on the overall population in subsequent years, but may reduce localized predation (Allen and Sargeant 1993). Phillips (1970) stated that fox populations are resilient and for fox control (by trapping) to be successful, pressure on the population must be almost continuous.

Phillips (1970) and Voigt (1987) also concluded that habitat destruction affects fox populations to a greater extent than short-term over-harvest.

In 1985, the red fox population in Maine was estimated at 74,162 fox and was projected to rise to 81,479 by 1990 (Caron 1986). Red fox are classified as furbearers in Maine, with a regulated hunting and trapping season with unlimited take. Also, a landowner or their agent may kill or have killed foxes that have damaged property, gardens, or homes (12MRSA §12401 and §12402) after receiving permission from a game warden or regional wildlife biologist.

This species is considered widespread and very common throughout most of the State of Maine. Between 2013 and 2017, the average annual statewide fur harvest of red fox in Maine has been 577 individuals (Table 4.2) (MDIFW 2017). Between 2013 and 2017, WS has employed lethal methods to remove an average of 14 red fox annually in the State during MDM activities (Table 4.1). WS has also destroyed an annual average of 6.2 red fox dens during this time as well.

Direct, Indirect, and Cumulative Effects:
In addition to causing damage to agricultural resources, property, and posing threats to human health and safety, red fox are also responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 30 red fox annually (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of red fox by WS, including red fox that could be taken to alleviate nest predation, would not exceed 50 red fox annually during all damage management activities, state-wide. Using the population estimate in 1990 of 81,479 individuals, WS' lethal take of 50 red fox would impact 0.06% of the population in Maine and 8.6% of the average annual harvest of red fox during the regular trapping season. Therefore, WS' lethal removal of 50 red fox is not likely to adversely impact red fox populations in Maine and will not limit the ability to harvest red fox in the State during the regulated trapping season. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Coyote

Coyotes range throughout the United States, with the highest densities occurring on the Plains and in the south-central United States. The distribution of coyotes in eastern North America began to expand beginning around 1900 to 1920. Now, all eastern states and Canadian provinces have at least a small population of coyotes (Voigt and Berg 1987). Coyotes use a variety of habitats from large tracts of forested land to urban neighborhoods. Coyotes feed on a wide variety of items such as rabbits, carrion, rodents, ungulates (usually fawns), insects (such as grasshoppers), fruits, vegetative matter, as well as livestock and poultry. In some areas, coyotes feed on human refuse at dump sites and take small domestic pets such as cats and dogs (Voigt and Berg 1987). In Maine, snowshoe hare and white-tailed deer are the main food source of coyotes (Jakubas 1999).

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

The coyote is probably the most extensively studied carnivore, and considerable research has been conducted on population dynamics. Data from scent-station indices suggest that density increases from north to south. Coyote densities as high as 2/km^2 (5/mi^2) have been reported in the southwestern and west-central U.S., but are lower in other portions of the country including eastern North America, although few studies have accurately determined densities (Voigt and Berg 1987). Although coyote densities vary based on local habitat quality, Knowlton (1972) published that density estimates of 0.5 to 1.0 coyotes per mi^2 would likely be applicable to coyote densities across much of their range.

In Maine, coyote home ranges have been documented as being much larger, and populations less dense. Harrison (1992a) identified coyote home ranges as being similar in three Maine study areas, ranging between 42 km^2 and 49 km^2 (16.2 mi^2 to 18.9 mi^2). Due to the fact that coyotes are extremely adaptable to a variety of habitat types, it is likely that habitat is not a limiting factor to coyotes in Maine; in fact high densities of coyotes also appear in the suburbs of major cities (Green and Gipson 1994). Other northeast studies have also documented similar coyote home ranges. In the Adirondacks of New York, where deer densities were estimated to be higher than Maine, the average home range size of coyotes was 38 km^2 (14.7 mi^2) (Brundige 1993). Consequently, the population size of coyotes in Maine can be determined by the number of territories that can be accommodated by the land area of Maine (or space) and the number of coyotes living in each territory. By using an average home range size, and the amount of suitable habitat in Maine, the MDIFW estimated a coyote population to be between 10,000 and 12,000 individuals (Jakubas, 1999).

Coyotes are classified as furbearers in Maine, with a regulated trapping season with unlimited take (MDIFW 2015). In addition, coyotes can be lethally taken throughout the year during a continuously open hunting season as well as a 37-week special night hunting season with unlimited take. Additionally, a landowner or their agent may kill or have killed any coyotes that have damaged property, gardens, or homes (12MRSA §12401 and §12402), and state policy empowers game wardens and biologists to investigate coyote depredations and deploy agents to remove specific coyotes known or suspected of causing agricultural losses. Between 2013 and 2017, the average annual statewide fur harvest of coyotes in Maine has been 1,187 individuals (Table 4.2) (MDIFW 2017). WS has employed lethal methods to remove an average of two coyotes annually in the State during MDM activities between 2013 and 2017 (Table 4.1).

Direct, Indirect, and Cumulative Effects:
WS could be requested to manage predation by coyotes on white-tailed deer in winter deer yards in Maine. Predation management techniques may include trapping, shooting, and night shooting. In addition to causing damage to agricultural resources, property, and posing threats to human health and safety, coyotes are also responsible for predation on threatened and endangered bird populations that are nesting on the coastal islands and beaches of Maine. The Maine Nest Predator EA analyzes the lethal take of 20 coyotes annually (USDA 2012). Based on previous requests for assistance received by WS, the cumulative take of coyotes by WS, including coyotes that could be taken to alleviate nest predation, would not exceed 200 coyotes annually during all damage management activities, statewide. To ensure a cumulative analysis of the potential take of coyotes to reduce threats to agriculture, property, natural resources, and human health and safety, this EA will evaluate the lethal take of up to 200 coyotes annually.

If using the conservative estimate of 10,000 coyotes, the lethal removal of up to 200 coyotes during MDM activities would impact up to 2.0% of the estimated coyote population in Maine based on the 1999 population estimate and a stable population trend and 17% of the annual average of coyotes harvested by fur trappers. Based on the limited take of coyotes while conducting MDM activities, the take of up to 200 coyotes annually will have no effect on coyote populations in Maine. WS' removal of up to 200 coyotes will not limit the ability of those interested to harvest coyotes during the regulated season in the state.

Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Black Bear

Historically, black bears occurred throughout all wooded areas of North America. After the European settlement of North America, bear numbers were greatly reduced by over harvest and deforestation. Bears were given greater protection by the 1950s, and have repopulated much of their historic range in the North (McLaughlin 1999). Black bears inhabit forest and swamps, preferring mixed stands of conifers and hardwoods (Godin 1977). Black bears are omnivorous and opportunistic, and feed on a variety of plant matter throughout the growing season, such as grass, clover, buds, fruits, and nuts. Their diet also includes insects, mammals, and birds. Bears are known to prey on young deer and moose in late spring, and will consume carrion. Bears take advantage of agricultural crops, bird feeders, and untended garbage. Bears spend the winter months of food shortage in a specialized form of hibernation where they recycle nitrogen waste from metabolic process into protein and are able to remain sedentary for long periods without muscle or bone loss (Harlow 2012). Although denned bears are in a deep sleeping state, they are easily aroused and will sometimes leave their dens if disturbed (McLaughlin 1999). The denning period may last from less than a month to over seven months, depending upon latitude and seasonal abundance of food. In Maine, bears generally enter dens between October 1st and December 1st and exit dens in late March or early April. Female black bear reach sexual maturity between 2 and 7 years of age (Pelton 2003). In Maine, most female black bears produce their first cub between 3 and 5 years of age. Females generally breed once every two years, but estrus can be induced every year if the cubs are taken from the female before the breeding season which occurs early June through mid-July (Godin 1977). Black bears lead solitary lives, except for breeding pairs, family groups, and concentrated food sources. Females use areas of six to nine square miles in Maine and remain within or near the range of their mother. Males disperse long distances (often up to 100 miles) before settling into adult ranges that may exceed 100 square miles (McLaughlin 1999).

A landowner or their agent may kill or have killed any bears that have damaged property, gardens, or homes (12MRSA §12401 and §12402), and state policy empowers game wardens and biologists to investigate bear depredations and deploy agents to remove specific bears known or suspected of causing agricultural losses. Black bears are classified as furbearers in Maine, with a regulated hunting and trapping season with limited take (MDIFW 2015). Between 2013 and 2017, the average annual statewide black bear harvest in Maine was 3,033 individuals (Table 4.2) (MDIFW 2017). The black bear population in Maine was has increased from 23,000 black bears in 2004 to approximately 36,000 in 2015 (MDIFW 2017). Research and Management Report WS has not taken any black bears in Maine as part of MDM activities between 2013 and 2017 (Table 4.1). However, black bears have been captured and released (or relocated) by WS in Maine in collaboration with MDIFW, to assist with research or alleviate damage to bee hives on blueberry growing operations. Between 2013 and 2017, an annual average of 12 black bears were captured and transferred, 8 were freed, and 1 collared by WS. All of this work was done under the direction of MDIFW.

Direct, Indirect, and Cumulative Effects:
In the future, WS may be requested to respond to human health and safety and damage issues relating to black bears in urban and residential areas, as well as assist on studies. WS may utilize Aldridge foot snares, culvert traps, relocation, or shooting to respond to our cooperators request. Any work conducted by WS with black bears would be done in consultation with MDIFW.

In future programs, WS may be requested to address predation or damage threats from black bears, but lethal removal would likely not exceed 20 animals annually. Using the 2015 population estimate of 36,000 individuals, WS' lethal take of 20 black bears during MDM activities would impact 0.05 % of the

population in Maine and 0.66% of the average annual harvest. Therefore, WS' lethal removal of 20 black bears is not likely to adversely impact the black bear population in Maine. In addition, WS' lethal removal will not limit the ability of those interested to harvest black bears during the regulated harvest season in the State. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

White-tailed Deer

Deer utilize forest-edge habitats that contain fields, forest openings, thickets, and wetlands, as well as active or reverting agricultural land (Godin 1977). Stands of mature conifers with tree height greater than 30 feet and crown closure of greater than 60% provides critical winter habitat for deer. As of 1999, 94% of Maine's upland habitat was considered deer habitat, excluding developed parts of the State. Summer home ranges for deer in Maine are generally 500 to 600 acres, but can vary from 150 acres to more than 2,000 acres (Lavigne 1999).

Deer are herbivores that feed on a wide variety of plants, fungi, and lichen. Plants that are fed upon throughout the year include; grasses, sedges, ferns, weeds, aquatic plants, leaves, fruits, hard mast, grains, and bark, twigs, and buds of many species of woody plants and trees. During the course of the year, deer may browse several hundred species of plants. A few are highly preferred, while many others are consumed only after the preferred species have been depleted. Overabundant deer populations can reduce the abundance of preferred forages, while causing unpalatable plants to become more common. When deer are over populated in an area, all of the food resources can be depleted. At these times, deer are susceptible to starvation and disease, and create increased conflicts with people (Lavigne 1999).

In Maine, the breeding season occurs during mid-November, although some breeding may occur in October and as late as January. The gestation period for deer is about 200 days, and does give birth from one to four fawns annually, although four is unusual. Fawn and yearling does usually do not produce more than one fawn (Lavigne 1999). Maine has an estimated population of 255,000 wintering deer across the state (MDIFW 2015). The approximate annual statewide deer harvest in 2016 was 23,512 (MDIFW 2017). WS has employed lethal methods to remove an average of 1.4 deer annually in the State during MDM activities between 2013 and 2017 (Table 4.1).

Direct, Indirect, and Cumulative Effects:
The number of white-tailed deer that may be lethally removed by WS is expected to have minimal effect on the overall white-tailed deer population in Maine. Requests to alleviate threats to human health and safety and damage caused by deer could increase in the future, but WS would not remove more than 50 deer annually. The lethal removal of up to 50 deer would constitute only 0.02% of the estimated wintering deer population in Maine, and 0.2% of the 2016 deer harvest in the State. Based on the limited take proposed by WS to alleviate threats to human health and safety, agriculture, property, and natural resources, WS' take of up to 50 white-tailed deer annually, would likely have no significant effect on deer populations in Maine. Since any deer that will be taken by WS will likely be in areas that are not open to hunting, such as inside an airport perimeter fence, WS' removal of up to 50 deer is not likely to limit the ability of those interested to harvest deer during the regulated season in the State. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Red Deer

Red deer, native to Europe and Asia, are usually between 1.6 and 2.6 m (5 ½ to 8 ½ ft) in length and a full-grown male stands about 1.2 m (4ft) at the shoulder, while females are slightly smaller, standing about 1 m at the shoulder. In the wild, adult males generally weigh between 90 and 260 kg (200 to 570lb)

depending upon the habitat, while females usually do not exceed 150 kg (330 lb) (Forestry Commission 2012).

Red deer are an exotic species that is only found in contained deer farms in Maine. The State of Maine reports 11 red deer farms containing 1,575 red deer (NASS 1997). Red deer held in captivity as alternative livestock, occasionally escape from enclosures and begin roaming. This concerns wildlife managers because exotic, escaped, cervids may spread disease between domestic and wild populations.

Since 2006, the Maine Department of Agriculture (DOA) and Inland Fisheries and Wildlife have asked WS to assist in euthanizing red deer that have been observed in the wild. The origins of the animals are unknown. Deer farms in the local area are contacted by DOA and are asked to account for all the animals in their herds. These actions are being undertaken as part of the Maine and United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services plan/procedure to prevent the occurrence of Chronic Wasting Disease (CWD) among its domestic and wild cervids, and are described in a signed MOU/protocol between the two State agencies. Between 2013and 2017, WS removed one red deer from the wild.

Direct, Indirect, and Cumulative Effects:

WS may be requested to remove escaped red deer in the future, but would not remove more than 50 individuals annually. Based on the limited take proposed by WS to prevent the occurrence of Chronic Wasting Disease (CWD) among its domestic and wild cervids from escaped, exotic, red deer, WS' take of 50 red deer annually in Maine would have no negative effect on the population or environment. Due to the fact that red deer are non-native to North America, take of red deer in Maine could be viewed as beneficial to the natural environment of Maine and the native species that exist here. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the human environment.

Sika and Fallow Deer

Sika deer are native to Asia and have been introduced into the wild on several continents, including the United States. Populations exist in the wild in Maryland, Virginia, Texas, and Kansas. Sika deer are reddish brown to yellow brown in color with a dark dorsal stripe surrounded by white spots in the summer. The coat turns to dark gray, almost black in the winter. Male sika deer weigh 40 to 70 kg (88.1 to 154.3 lb) and stand 70 to 95 cm (27.5 to 37.4 in) at the shoulder. Female sika deer weigh 30 to 45 kg (66 to 99.2 lb) and stand 50 to 90 cm (19.6 to 35.4 in) at the shoulder. Sika deer use woodland and grassland habitat and feed on grasses, shrubs, and trees. Where they have been introduced in the United Kingdom, sika deer use coniferous woodlands and heaths. Breeding takes place between September and November, with one young being born between May and June. Birth is given to twins on rare occasion (Putnam 2000).

Fallow deer are native to Europe and have been introduced into the wild on several continents, including the United States. There are four main variations in color but the common variety has tan pelage with white spotting on the flanks and white rump patch. The Menil variety is paler, lacks the black bordered rump and keeps its white spots all year. The black variety is almost entirely black with no white coloration anywhere and the white variety can be white to sandy colored. Male fallow deer measure 84 to 94 cm (33 to 37 in) at the shoulder and weigh 46 to 94 kg (101 to 207 lb). Female fallow deer measure 73 to 91 cm at the shoulder and weigh 35 to 56 kg. Fallow deer use a variety of woodland and grassland habitats and prefer to eat grasses but will feed on shrubs and trees in winter. Breeding takes place in the fall and young are born in June (Langbein and Chapman 2002).

In addition to populations existing in the wild in the United States, sika and fallow deer held in captivity as alternative livestock, occasionally escape from enclosures and begin roaming. This concerns wildlife managers because exotic, escaped, cervids may spread disease between domestic and wild populations. WS did not lethally remove any sika deer between 2013 and 2017 but did remove one fallow deer during that time.

Direct, Indirect, and Cumulative Effects:
WS would not remove more than 50 of each species annually. Based on the limited take proposed by WS to prevent the occurrence of Chronic Wasting Disease (CWD) among its domestic and wild cervids from escaped, exotic, Sika and fallow deer, WS' annual take of 50 of each species in Maine would have no negative effect on the population or environment. Due to the fact that sika and fallow deer are non-native to North America, take of these species in Maine could be viewed as beneficial to the natural environment of Maine and the native species that exist here. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the human environment.

Moose

Moose occur in the Northern United States, most of Canada, and Alaska. Of the four subspecies of moose recognized in North America, the Eastern or Taiga moose is the subspecies found in Maine (Morris 1999). Moose feed on the leaves, buds, twigs, and bark of woody and aquatic plants preferring to browse on willow, aspen, birch, maple, pin cherry, and mountain ash throughout the year. Balsam fir is an important food source for moose in the winter months. Moose typically spend winters at higher elevations where more hardwood browse is available, often feeding in regenerating stands. Mature coniferous forests are used for cover when snow depth exceeds 3 feet (Morris 1999).

The breeding season begins in late September and lasts into early October. Each May, cows give birth to one or two calves. Cows can give birth to their first calf when they are two years of age, with most cows giving birth to a calf by three years of age. A cow's overall health and nutritional condition determines the number of calves born and when a cow first breeds. Calves remain with their mother for one year and disperse shortly before the next calf is born. Bulls are able to breed as yearlings, but most do not breed until they are older and can compete with larger bulls (Morris 1999).

From the writings of early North American explorers it is known that moose were abundant in New England during the 17th century. By the early 20th century, moose populations in Maine had declined to an estimated 2,000 individuals. The decline is attributed to unrestricted hunting, the clearing of forestland for farming, and brain worm. During the 20th century, laws protecting moose from excessive hunting and improving habitat conditions allowed the moose population to increase to an estimated 29,000 moose (Morris 1999).

Between 2005 and 2007, 1,969 moose were killed from vehicle collisions. In 2016, 1,609 moose were killed by hunters in the state of Maine. Beginning in 2009, the MDIFW implemented a controlled moose hunt in eastern Aroostook County hunt area comprised of nine townships in order to reduce crop damage from August through September. The moose population in Maine is currently estimated at 76,000 (MDIFW 2015). An ongoing moose survival study will reveal further information on the population in Maine, with particular focus on the winter tick's effect on the population. No moose were taken by WS in Maine between 2013 and 2017.

Direct, Indirect, and Cumulative Effects:
WS may be requested for assistance with moose in the future but take would not exceed five moose annually. This limited take would only constitute 0.017% of the moose population and 0.3% of the annual moose harvest in the State during 2016. WS take would likely have no significant impact on

moose populations in the State of Maine. Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the population.

Feral Swine

Feral swine are very diverse in their physical appearance and behavior. In 1991, Mayer and Brisbin (as cited in West et al. 2009) reported that wild pigs are usually black in color, but individuals may be nearly any color or combination of colors. Eurasian wild boars typically have a coat of brown to black hairs with grizzled coloration, whereas wild pigs from domestic ancestry are characterized by uniformly colored hair. The average total length of adult wild pigs ranges from about 127 to 190.5 cm (50 to 75 in), and average weights vary from about 34 to 113 kg (75 to 250 lb) (West et al. 2009).

Feral swine are not native to North America, but now inhabit much of the United States (West et al 2009). In 1991, Mayer and Brisbin (as cited in West et al. 2009) reported that pigs were a popular livestock for American settlers colonizing new areas and were likely first introduced into the New World by Christopher Columbus in 1493 in the West Indies. Since then, pigs have been released throughout the United States, particularly in the southeastern states. Since the 16th century, open ranging of pigs by settlers, farmers, and Native Americans led to the spread of pigs in the United States. In 1982, Sweeney and Sweeney (as cited in West et al. 2009) reported that by the early 1980s, wild pigs ranged from the Coastal Plain of Virginia south to Florida, and west to Texas and California. It was thought that pigs were a southern species and that harsh winters would limit their expansion northward, however, pig populations now exist in the northern climates of Michigan and North Dakota (West et al. 2009).

Feral swine utilize a variety of habitats such as forests, thick shrubby areas, mountains, valleys, grasslands, and agricultural lands. Pigs are extremely opportunistic and will eat almost any kind of plant or animal matter that is available, such as nuts, grains, berries, leaves, fungi, roots, small mammals, carrion, birds, eggs, snails, amphibians, reptiles, insects, and worms (Godin 1977). Pigs can breed throughout the year, typically producing one litter of three to eight piglets a year, but are capable of producing two litters a year (West et al. 2009).

Currently, feral swine are expanding their range and their population is growing in the United States. It is thought that wild pigs are the most prolific large mammal on Earth. Pig population growth occurs quickly because they reach sexual maturity at a young age, natural mortality rates are low, and females can produce large litters, multiple times each year (West et al. 2009). In 1978, Decker (as cited in West et al. 2009) reported wild pigs to be the most abundant, free-ranging, introduced ungulate in the United States. In 1991, Mayer and Brisbin (as cited in West et al. 2009) suggested a United States population between 1 and 2 million wild pigs. In 2003, Taylor (as cited in West et al. 2009) speculated that the wild pig population in Texas alone numbered 1.5 million animals.

Feral swine populations are not known to be present in Maine; however, several escaped pigs have been documented living in the wild in Maine for extended periods of time before being re-captured or shot. Feral swine populations have been documented in eastern New Hampshire (Musante et al. 2014). Given their prolific nature and adaptability to cold northern climates, it is possible that feral pigs could become established in Maine. There were 4,900 pigs inventoried in Maine farms in 2009 (NASS 2011). The Maine Department of Agriculture reports that there are currently 11 hunt parks in Maine that have feral swine (Michele Walsh pers. Comm. 2014). It is also possible for domestic pigs or captive feral swine to escape from farms and survive in the wild. Feral swine are known to carry disease and parasites that pose a threat to humans, livestock, and wildlife into new areas. For example, an individual from the feral swine population in New Hampshire tested antibody positive for pseudorabies virus (Musante et al. 2014). In addition, two individuals were found to be infested with winter ticks (*Dermacentor albipictus*) (Musante et al. 2014). These recent discoveries show how feral swine could contribute to the spread of

disease to other wildlife populations (Musante et al. 2014). WS has captured six escaped pigs in Maine that were living in the wild between 2013 and 2017. Under the direction of the State Department of Agriculture, these animals were transferred back to the owner.

Direct, Indirect, and Cumulative Effects:
Due to their destructive nature and the disease threat they pose, it is conceivable that WS may be requested for assistance in the future with feral swine in Maine but take would not exceed 200 individuals. Based on the limited take proposed by WS, annual take of 200 feral swine in Maine, would have no negative effect on the population or environment. WS' take of feral swine in Maine could be considered beneficial because feral swine are considered non-native, invasive, and highly destructive (West et al. 2009). Based on the best available scientific information, WS does not anticipate any significant direct or cumulative impacts to the human environment.

Other Target Species
In addition to the mammals analyzed above, other target species could be lethally removed in small numbers by WS, or could be lethally removed when requested to resolve mammal damage or threats of mammal damage, on private or public lands. Under the proposed action, WS could lethally remove 10 northern flying squirrels, 25 snowshoe hares, 25 muskrats, 20 short-tailed weasels, 20 long-tailed weasels, 10 pine martens, 10 fishers, 10 river otters, and 10 bobcats. The removal of each respective number of 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. The estimated WS removal would be of low magnitude when compared to the number of those game species harvested each year, and would be of extremely low magnitude when compared to the statewide population of those species. Those species are not considered to be of low densities in the state.

Wildlife Disease Surveillance and Monitoring

The ability to efficiently conduct surveillance for diseases is dependent upon rapid detection of the pathogen if it is introduced. Effective implementation of a surveillance system will facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It will also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups. Data collected by organizations/agencies conducting research and monitoring will provide a broad species and geographic surveillance effort.

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

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

Surveillance in Live Wild Mammals: This strategy involves sampling live-captured, apparently healthy mammals, to detect the presence of a disease. Mammal species that represent the highest risk of being exposed to, or infected with, the disease because of their movement patterns, or mammals that may be in

contact with species from areas with reported outbreaks would be targeted. Where possible, this sampling effort would be coordinated with local projects that already plan on capturing and handling the desired mammal species. Coordinating sampling with ongoing projects currently being conducted by state and federal agencies, universities, and others maximizes use of resources and minimizes the need for additional mammal capture and handling.

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

Under the disease sampling strategies listed above that could be implemented to detect or monitor mammalian diseases, WS' implementation of those sampling strategies would not adversely affect mammal populations in the state. Sampling strategies that could be employed involve sampling live-captured mammals that could be released on site after sampling occurs. The sampling (*e.g.*, drawing blood, hair sample, fecal sample) and the subsequent release of live-captured mammals would not result in adverse effects since those mammals are released unharmed on site. In addition, sampling of sick, dying, or hunter harvested mammals would not result in the additive lethal take of mammals that would not have already occurred in the absence of a disease sampling program. Therefore, the sampling of mammals for diseases would not adversely affect the populations of any of the mammal species addressed in this EA and would not result in any take of mammals that would not have already occurred in the absence of disease sampling (*e.g.*, hunter harvest).

Summary

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

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

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

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

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

Direct, Indirect, and Cumulative Effects:

Although WS lethal removal of mammals would not occur, it is likely that without WS conducting some level of lethal MDM activities for these species, private MDM efforts would increase. Cumulative impacts on target species populations would be variable depending upon actions taken by affected landowners/resource managers and the level of training and experience of the individuals conducting the MDM. Some individuals experiencing damage may take illegal or unsafe action against the problem species either unintentionally due to lack of training, or deliberately out of frustration of continued damage. In these instances, more target species may be lethally removed than with a professional MDM program (Alternative 1). Overall impacts on target species populations would be similar to or slightly more significant than Alternative 1 depending upon the extent to which resource managers use the assistance provided by WS. However, for the reasons presented in the population effects analysis in section 3.1, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

Alternative 3 - No Mammal Damage Management Conducted by WS

Under this alternative, WS would not conduct mammal damage management activities in the state. WS would have no direct involvement with any aspect of addressing damage caused by mammals and would provide no technical assistance. Mammals could continue to be lethally removed to resolve damage and/or threats occurring either through permits issued by the MDIFW, during the regulated hunting or trapping seasons, or without a permit as allowed in certain situations by state laws and regulations. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Direct, Indirect, and Cumulative Effects:

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

Since mammals would still be lethally removed under this alternative, the potential effects on the populations of those mammal species would be similar among all the alternatives for this issue. Any actions to resolve damage or reduce threats associated with mammals could occur by other entities despite WS' lack of involvement under this alternative. However, for the reasons presented in the population effects analysis in section 3.1, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

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

A concern is often raised about the potential impacts to nontarget species, including T&E species, from the use of methods to resolve damage caused by mammals. The potential effects on the populations of nontarget wildlife species, including T&E species, are analyzed below.

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

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

WS personnel are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding 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 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 MDIFW to determine the potential risks to federally- and state-listed threatened and endangered species in accordance with the ESA and state laws. Non-lethal methods are given priority when addressing requests for assistance (WS Directive 2.101). Nontarget animals captured in traps are released unless it is determined by WS that the animal would not survive or that the animal cannot be safely released. When the appropriate situation arises and when permitted by the MDIFW, WS can trap and translocate nontarget species. 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.

Non-lethal Methods

Non-lethal methods have the potential to cause adverse effects to nontargets primarily though physical exclusion, frightening devices or deterrents (see Appendix B). 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 B). 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 cable restraint within 50 feet of a carcass which may attract eagles).

All of the lethal methods listed in Appendix B could be available under this alternative. 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. Additionally, suppressed firearms would be used when appropriate to minimize noise impacts to nontargets.

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

Cable Restraints - WS would use cable restraints 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.

Body grippping Trap (e.g., Conibear) - WS would use body gripping 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 threatened and endangered species. Rodenticides would be used by WS in accordance with their label and WS Directive 2.401 to minimize risks to nontargets. Rodenticides will not be used in a manner that would contaminate drinking water supplies.

Fumigants - Only fumigants and toxicants registered with the EPA and the VFWD Division of Materials Management pursuant to the FIFRA would be recommended and used by WS under this

alternative. Fumigants and toxicants, including restricted use toxicants, could be used by licensed non-WS' pesticide applicators; therefore, WS' use of fumigants and toxicants would provide no additional negative impacts on nontarget species as these substances could be used in the absence of WS' involvement. WS personnel are trained and licensed in the safe and effective use of fumigants and toxicants as well as the behavior and biology of both target and nontarget wildlife species.

Direct, Indirect, and Cumulative Effects:
The persistent use of non-lethal methods would likely result in the dispersal or abandonment of those areas where non-lethal methods are employed of both target and nontarget species. Therefore, any use of non-lethal 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. Non-lethal methods are generally regarded as having minimal impacts on populations because individuals are unharmed. Therefore, non-lethal methods would not have any significant adverse impacts on nontarget populations of wildlife including threatened and endangered species under this alternative.

Only those repellents registered with the EPA and the MBPC pursuant to the FIFRA would be recommended and used by WS under this alternative. 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.

Mammals could still be lethally removed during the regulated harvest season, when causing damage, and through the issuance of permits by the MDIFW under this alternative. WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage caused by target mammals. Lethal methods available for use to manage damage caused by mammals under this alternative would include shooting, body-gripping traps, cable restraints, snap traps, euthanasia after live-capture, and registered fumigants and toxicants.

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

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. Additionally, WS personnel would follow all label directions during pesticide applications. 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 nontarget domestic species such as dogs are not exposed.

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 2013 and 2017, only seven nontarget mammals were unintentionally lethally removed by WS-Maine (one river otter, two gray squirrels, and six red squirrels). 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 MDIFW any nontarget lethal

removal to ensure lethal removal by WS is considered as part of management objectives established. The potential impacts to nontargets are similar to the other alternatives and are considered to be minimal to non-existent.

The proposed MDM could benefit many other wildlife species that are impacted by predation, habitat modification or competition for resources. For example, fox often feed on the eggs, nestlings, and fledglings of ground nesting bird species. This alternative has the greatest possibility of successfully reducing mammal damage and conflicts to wildlife species since all available methods could possibly be implemented or recommended by WS.

T&E Species Effects

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. SOPs to avoid T&E effects are described in Chapter 2 of this EA.

Federally Listed Species - The list of species federally designated as threatened and endangered in Maine as determined by the USFWS and the National Marine Fisheries Service was obtained and reviewed during the development of this EA. After review of the T&E species listed in Maine and the activities described in this EA, WS had determined that activities conducted pursuant to the proposed action would either have a "no effect" determination, or a "may affect but not likely to adversely affect" determination on T&E species listed in Maine or their critical habitats (Appendix C). WS conducted a formal consultation under Section 7 with the USFWS, and a Programmatic Biological Opinion (PBO) resulted, dated April 27, 2018. The PBO reviewed the potential effects of the WS MDM program on the federally listed Canada lynx (*Lynx Canadensis*) and the federally endangered Atlantic salmon (*Salmo salar*) and their respective designated critical habitat. The PBO findings showed a no effect and not likely to adversely affect determinations for these species and their habitats (USFWS 2018). The PBO describes the methods used to avoid disturbance and take of the federally listed Atlantic salmon and Canada lynx (USFWS 2018).

State Listed Species - The current list of state listed species as determined by the MDIFW was obtained and reviewed during the development of the EA (see Appendix D). WS has consulted with the MDIFW to determine if the proposed activities would adversely affect those species currently listed by the state. The MDIFW has concurred that the likelihood of adverse impacts to state endangered or threatened species as a result of methods outlined by WS are very low or not likely to occur utilizing the integrated management approach presented in WS proposed plan (Charles Todd, MDIFW, Pers. Comm., 2018).

WS considers the importance of avoiding disturbance and lethal take of all T&E species to be essential. Here we provide the example of the New England cottontail as a species of special consideration in Maine and how WS would employ professional knowledge and training experience to minimize the impacts that MDM has on these species.

New England Cottontail

The New England cottontail is considered an endangered species by the MDIFW. The New England cottontail can be found in the southern portion of Maine, limited to York and Cumberland Counties (Todd, MDIFW, Pers. Comm., 2018). New England cottontails utilize specific habitat types including shrub lands, thickets, and early-successional forests. Microhabitats containing more than 20,000 stem cover units per acre are preferred by this species (USFWS and NRCS 2011). Breeding occurs from March into September, during which time, several litters can be produced. Four weeks after breeding, the mother gives birth to up to five young. After two weeks, the young disperse, and have an average life

span of 15 months (Wildlife Management Institute 2012). WS, in consultation with the MDIFW, has established a protocol for avoiding the capture of cottontail rabbits (USDA 2012):

1. General provisions for all trapping activities will include:

    a) All traps used will meet the criteria of the Best Management Practices (BMP) to reduce injury to the specific target animal and avoid nontarget capture.

    b) All foothold trap pans will be adjusted to have approximately two pounds of pressure required for engagement of the jaws.

    c) All foothold traps will be solidly anchored using either double rebar stakes, or cable earth anchors.

    d) All foothold traps will be checked at or before sunrise to reduce human conflicts and minimize the length of time trapped animals spend in traps.

    e) In general, most foothold traps will be set using scent attractors (lures and urines), and will be either dirthole, flat, or scent-post style trap sets.

    f) If needed, USDA WS will establish additional contact with MDIFW regional staff and/or the Species Specialist for additional techniques for avoiding incidental take of New England Cottontails.

    g) USDA WS will immediately report any take of a New England Cottontail to MDIFW regional staff and/or the Species Specialist. This notification is required to determine the disposition of the rabbit (e.g. translocation, tagging, etc.)

    h) USDA WS technicians will be trained on the handling of NEC for the purpose of assisting MDIFW with reintroduction/translocation efforts.

2. In areas where New England Cottontails are not known to inhabit:

    a) Foothold and body gripping traps will not be placed in areas with dense woody understory vegetation.

    b) All trap types (foothold, conibear, cage, and weasel box) may be placed in areas containing sparse woody vegetation, but judgment will be used to avoid areas that would likely harbor New England Cottontails if they were present.

    c) Blind (trail) sets may be used on occasion, but judgment will be used to locate them away from cover types that may be attractive to New England Cottontails.

3. In areas where New England Cottontails are <u>known</u> to inhabit:

    a) No foothold or body gripping traps will be placed in areas containing woody vegetation and will be set a minimum of 50 feet from understory woody vegetation.

b) The location of cage traps may involve placement in areas of woody vegetation; however, cage traps will not be placed in areas containing dense vegetation of any kind. Only limited debris or vegetation will be used to conceal the trap. Cage traps will be baited with materials not believed to be attractive to New England Cottontails. Cage traps will be checked up to two times per day, and must be checked between the hours of 8:00 and 9:00 a.m. (if a cage trap is visited at sunrise, it must be re-checked the same day within the time period indicated above). Further, cage traps should not be placed in areas with thick vegetation.

c) Weasel box traps equipped with rat-size snap traps will contain entrance holes no greater than 2.25 inches in diameter, and will eliminate the chance that a rabbit would be caught; therefore, the placement of these devices will not be restricted.

d) Duffer-type foothold traps (also called egg traps, coon cuffs, bandit busters, Lil' Grizz Get'rz, etc.) that are designed primarily to catch raccoons may be set in any location.

In general, avoidance of New England cottontails would be achieved by not placing traps where those species would encounter them.

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 MDIFW to determine the potential risks to eagles and federally- and state-listed threatened and endangered 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. Furthermore, WS has partnered with MDIFW and will provide biological samples or data for monitoring and research for both nontarget and target species. Potential direct and cumulative impacts to nontargets, including threatened and endangered 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 - Non-lethal Mammal Damage Management Only by WS

Under this alternative, risks to nontarget species from WS actions would likely be limited to the use of frightening devices, exclusionary devices, and the risks of unintentional capture of a nontarget in a livecapture device as outlined under Alternative 1. Trap and translocation of nontarget species can will be considered by WS when appropriate and when permitted by the MDIFW. Although the availability of WS assistance with non-lethal MDM methods could decrease incentives for non-WS entities to use lethal MDM methods, non-WS efforts to reduce or prevent damage could result in less experienced persons implementing lethal MDM methods and lead to a greater removal of nontarget wildlife.

Direct, Indirect, and Cumulative Effects:
Under this alternative, WS' efforts to protect rare, threatened or endangered species would not be as effective as the preferred alternative (Alternative 1) because WS would be unable to access lethal techniques if non-lethal techniques are ineffective. Lethal efforts to protect these species would have to be conducted by other natural resource management entities. Capture and release (*e.g.*, for disease monitoring) and capture and relocate would be allowed under this alternative. There is the remote chance that the capture devices could result in the death of a nontarget animal. However, given that these devices

would be applied with provisions to keep the target animal alive, the risks to nontarget species are very low and would not result in adverse impacts on nontarget species populations.

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

T&E Species Effects
WS' impacts on T&E species would be similar to the non-lethal methods used under Alternative 1. Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to T&E species. Risks to T&E species may be lower with this alternative than with Alternative 3 because people would have ready access to assistance with non-lethal MDM techniques. WS, with the assistance of MDIFW, could advise individuals as to the potential presence of state and federally listed species in their area.

Alternative 3 - No Mammal Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with mammal damage management activities. Therefore, no direct impacts to nontargets or T&E species would occur by WS under this alternative. Mammals would continue to be lethally removed under permits issued by MDIFW, harvest would continue to occur during the regulated season, and non-native mammal species could continue to be lethally removed without the need for a permit.

Direct, Indirect, and Cumulative Effects:
The ability to reduce damage and threats of damage caused by mammals to other wildlife species, including T&E species, and their habitats would be variable 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 B 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.

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

Issue 3 - Effects on Human Health and Safety

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

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

WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve requests for assistance. The methods chosen would be continually evaluated for effectiveness and, if necessary, additional methods could be employed. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives and minimal to non-existent. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS would be similar to those risks addressed by the other alternatives and also minimal.

WS' employees who conduct MDM activities would be knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' Directives. That knowledge would be incorporated into the decision-making process inherent with the WS' Decision Model that would be applied when addressing threats and damage caused by mammals. Prior to and during the utilization of lethal methods, WS' employees would consider risks to human safety based on location and method. Risks to human safety from the use of methods would likely be greater in urban areas when compared to rural areas that are less densely populated. Consideration would also be given to the location where damage management activities would be conducted based on property ownership. Activities would generally be conducted when human activity is minimal (*e.g.,* early mornings, at night) and/or in areas where human activities are minimal (*e.g.,* in areas closed to the public).

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

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

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

repellents (Appendix B). The use of immobilizing drugs under the identified alternatives would only be administered to mammals that have been live-captured using other methods or administered through injection using a projectile (*e.g.*, dart gun). Immobilizing drugs used to sedate wildlife are used to temporary handle and transport animals to lessen the distress of the animal from the experience. Drug delivery to immobilize mammals is likely to occur on site with close monitoring of the animal to ensure proper care of the animal. Immobilizing drugs are fully reversible with a full recovery of sedated animals occurring.

Euthanizing drugs would be administered under similar circumstances to immobilizing drugs under the relevant proposed alternatives. Euthanized animals would be disposed of in accordance with WS Directives and in accordance with label directions; therefore, would not be available for harvest and consumption. If mammals were immobilized for sampling or translocation and released, risks could occur to human safety if harvest and consumption occurred. SOPs employed by WS to reduce risks are discussed in Chapter 2.

The cooperator requesting assistance is made aware through a MOU, CSA, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator; thereby, making the cooperator aware of the use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods.

Direct, Indirect, and Cumulative Effects:
To help ensure safe use and awareness, WS' employees who use firearms during official duties are required to attend an approved firearm safety training course and attend a safety training course in accordance with WS Directive 2.615 to remain certified for firearm use. As a condition of employment, WS' employees who carry and use firearms are subject to the Lautenberg Domestic Confiscation Law, which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence (18 USC § 922(g)(9)). A safety assessment based on site evaluations, coordination with cooperating and local agencies (if applicable), and consultation with cooperators would be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS and cooperating agencies would work closely with cooperators requesting assistance to ensure all safety issues are considered before firearms are deemed appropriate for use. The use of all methods, including firearms, must be agreed upon with the cooperator to ensure the safe use of those methods.

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

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 in the absence of the public to further minimize risks, whenever possible. All WS' personnel who apply fumigants and toxicants registered with the EPA pursuant to the FIFRA are licensed as pesticide applicators by the MBPC. 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. WS would utilize locking bait stations to restrict access of children to rodenticides such as anticoagulants. As appropriate, WS would use signage and other means of notification to ensure the public is aware of fumigant or toxicant applications or applications sites, to ensure people, including children, are not exposed.

The recommendation of repellents or the use of those repellents registered for use to disperse mammals could occur under the proposed action as part of an integrated approach to managing mammal damage. Those chemical repellents that would be available to recommend for use or be directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. 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 MDIFW 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 MDIFW 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 and/or trapping to reduce localized populations of mammals would not increase those risks.

The risks to human safety from the use of non-lethal 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 non-lethal methods. Since WS personnel are required to complete and maintain firearms safety training, no adverse direct effects to human health and safety are expected as a result of the misuse of firearms by WS personnel. Additionally, 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 - Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would not use lethal MDM methods. Concerns about human health risks from WS' use of lethal mammal damage management methods would be alleviated because no such use would occur. However, most lethal methods would still be available to licensed pest control operators. Benefits to the public from WS' MDM activities will depend on the ability of WS to resolve problems using nonlethal methods and the effectiveness of non-WS MDM efforts. In situations where risks to human health and safety from mammals cannot be resolved using non-lethal methods, benefits to the public will

depend on the efficacy of non-WS use of lethal MDM methods. If lethal MDM programs are implemented by individuals with less experience than WS, they may not be able to safely and effectively resolve the problem or it may take longer to resolve the problem than with a WS program.

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

Alternative 3 - No Mammal Damage Management Conducted by WS

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

Direct, Indirect, and Cumulative Effects:
Similar to Alternative 2, reproductive inhibitors, immobilizing drugs, and euthanasia chemicals would not be available under this alternative to those persons experiencing damage or threats from mammals unless proper training and certifications were obtained. However, fumigants, toxicants, and repellents would continue to be available to those persons with the appropriate pesticide applicators license. Since most methods available to resolve or prevent mammal damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. Habitat modification and harassment methods are also generally regarded as posing minimal adverse direct and indirect effects to human safety. Although some risks to safety are likely to occur with the use of pyrotechnics, propane cannons, and exclusion devices, those risks are minimal when those methods are used appropriately and in consideration of human safety. However, methods employed by those not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 – Humaneness and Animal Welfare Concerns of Methods

The issues of method humaneness relating to the alternatives are discussed below.

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

Under the proposed action, WS would integrate methods using WS' Decision Model as part of technical assistance and direct operational assistance. Methods available under the proposed action could include non-lethal and lethal methods integrated into direct operational assistance. Under this alternative, nonlethal methods would be used by WS which are generally regarded as humane. Non-lethal methods would include resource management methods (*e.g.*, crop selection, habitat modification, modification of

human behavior), exclusion devices, frightening devices, reproductive inhibitors, nets, repellents and live-capture traps for trap and translocation.

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

The AVMA states "...euthanasia is the act of inducing humane death in an animal" and "...that 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" (Beaver et al. 2001).

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 his or her 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 (*e.g.*, distinguishes between euthanasia and methods that are more accurately characterized as humane killing). Because of the variety of situations that may be encountered, it is difficult to strictly classify methods for termination of free-ranging wildlife as acceptable, acceptable with conditions, or unacceptable. Furthermore, classification of a given method as a means of euthanasia or humane killing may vary by circumstances. These acknowledgments are not intended to condone a lower standard for the humane termination of wildlife. The best methods possible under the circumstances must be applied, and new technology and methods demonstrated to be superior to previously used methods must be embraced."

Direct, Indirect, and Cumulative Effects:
The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology. MDM methods viewed by some persons as inhumane would

be employed by WS under this alternative. These methods would include shooting, trapping, toxicants/chemicals, and cable restraints. Despite SOPs and state trapping regulations designed to maximize humaneness, the perceived stress and trauma associated with being held in a trap or cable restraint until the WS employee arrives at the capture site to dispatch or release the animal, is unacceptable to some persons. Other MDM methods used to remove target animals including shooting and use of body-gripping traps (*i.e.,* conibear) result in a relatively humane death because the animals die instantly or within seconds to a few minutes. These methods however, are also considered inhumane by some individuals.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some MDM methods are used in situations where non-lethal damage management methods are not practical or effective. No indirect or cumulative adverse impacts were identified for this issue.

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

The issues of humaneness under this alternative are likely to be perceived to be similar to issues discussed under the proposed action. This perceived similarity is derived from WS' recommendation of methods that some consider inhumane. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requester employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to the proposed action.

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

Alternative 3 - No Mammal Damage Management Conducted by WS

Under this alternative, WS would have no involvement in any aspect of MDM in Maine. Those persons experiencing damage or threats associated with mammals could continue to use those methods legally available. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the general public since methods are often labeled as inhumane/unacceptable by segments of society no matter the entity employing those methods.

Direct, Indirect, and Cumulative Effects:
The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals

and groups would still be available to the general public to use to resolve damage and threats caused by mammals.

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 threatened and endangered species recovery plans or labeled as such by USFWS and/or MDIFW), 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 Maine

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 Maine to analyze individual and cumulative impacts, provide a thorough analysis of other issues relevant to MDM, and provides the public an opportunity to review and comment on the analysis and alternatives.

In terms of considering cumulative effects, one EA analyzing impacts for the entire state will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. As most mammals are regulated by the MDIFW, 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 Maine 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 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 it reaches a threshold where damage becomes an economic burden. That tolerance or threshold level

before lethal methods are implemented would differ among cooperators and damage situations. In human health and safety situations establishing a threshold would be difficult or inappropriate because human lives and health could be at stake and attributing a cost to human life or health is unethical.

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 MDM 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 Maine. 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 B, 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 (WS Directive 2.515) of mammal carcasses will 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 (0.12.0%) (USEPA 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 (The Wildlife Society 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; The Wildlife Society 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 (USEPA 2013). Since the lethal removal of mammals can occur during regulated hunting seasons or through the issuance of permits by the MDIFW, 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 MDM 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 from mammal carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water.

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

Another issue commonly identified is a concern that mammal damage management activities conducted by WS would affect the opportunity for persons to harvest those species during the regulated hunting and trapping seasons, either by reducing local populations through the lethal removal of mammals or by reducing the number of mammals present in an area through dispersal techniques. Those species that are addressed in this EA that also can be hunted or trapped during regulated seasons in Maine include: beaver, bobcat, black bear, coyote, red fox, gray fox, woodchuck, muskrat, Virginia opossum, eastern cottontail, raccoon, striped skunk, eastern gray squirrel, red squirrel, river otter, mink, short-tailed weasel, long-tailed weasel, and fisher.

Potential impacts could arise from the use of non-lethal or lethal damage management methods. Nonlethal methods used to reduce or alleviate damage, reduce mammal densities by dispersing animals from areas where damage or the threat of damage is occurring. Similarly, lethal methods used to reduce damage could locally lower target species densities in areas where damage is occurring, resulting in a reduction in the availability of those species during the regulated harvest season. WS' MDM activities would primarily be conducted in areas where hunting access is restricted (*e.g.,* airports, urban areas) or hunting has been ineffective. The use of non-lethal or lethal methods often disperses mammals from areas where damage is occurring to areas outside the damage area, which could serve to move those mammal species from those less accessible areas to places more accessible to hunters and trappers. In addition, in appropriate situations, WS commonly recommends recreational hunting and trapping as a damage management alternative for many of the species listed in this EA.

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 through approval by MDIFW. Beaver dam removal during activities to manage damage caused by beaver sometimes occurs in areas inundated by water resulting from flooding. Beaver 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 establish 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 public property such as roads and bridges, water management structures, agricultural crops, and timber resources. 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 excavators 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 in compliance with Articles 15 and 24 from the USACE and MDIFW prior to removing a blockage. WS' personnel determine the proper course of action upon inspecting a beaver dam impoundment.

3.3 SUMMARY OF IMPACTS

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). No risk to public safety is expected when WS' programs are provided and accepted by requesting individuals in Alternative 1 since only trained and experienced wildlife biologists/specialists would conduct and recommend MDM activities. There is a slight increased risk to public safety when persons who reject WS assistance and recommendations in Alternatives 1 and 2 conduct their own MDM activities, and when no WS assistance is provided as in Alternative 3. In all three Alternatives, however, the increase in risk would not be to the point that the impacts would be significant. Although some persons will likely be opposed to WS's participation in MDM activities on public and private lands, the analysis in this EA indicates that WS Integrated MDM program will not result in significant cumulative adverse impacts on the quality of the human environment.

CHAPTER 4: LIST OF PREPARERS AND PERSONS CONSULTED

4.1 LIST OF PREPARERS

Robin Dyer: USDA-APHIS-WS, State Director, Augusta, ME
Christopher K. Croson: USDA-APHIS-WS, Environmental Management Coordinator, Mooresville, NC
Ben Nugent: USDA-APHIS-WS, District Supervisor, Augusta, ME

4.2 LIST OF PERSONS/AGENCIES CONSULTED

United States Department of the Interior, Fish and Wildlife Service
Maine Department of Marine Resources
Maine Department of Inland Fisheries and Wildlife
Maine Department of Agriculture and Forestry
Maine Department of Environmental Protection

APPENDIX A: LITERATURE CITED

ABC. 2011. Domestic cat predation on birds and other wildlife. http://www.abcbirds.org/abcprograms/policy/cats/materials/CatPredation2011.pdf. Accessed July 3, 2018.

Allen, D.L. 1938. Ecological studies on the vertebrate fauna of a 500-acre farm in Kalamazoo County, Michigan. Ecol. Monogr. 8:347-436.

Allen, S. H., and A. B. Sargeant. 1993. Dispersal patterns of red foxes relative to population density. J. Wildl. Manage. 57:526-533.

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

Archer, J. 1999. The Nature of Grief: The Evolution and Psychology of Reactions to Loss. Taylor & Francis/Routledge, Florence, KY. 317pp.

Association of Fish and Wildlife Agencies. 2006. Best management practices for trapping in the United States. Washington, D.C.

ASM (American Society of Mammalogists). 2011. Mammals of Maine. Http://www.mammalsociety.org/mammals-maine.

AVMA (American Veterinary Medical Association). 1987. Panel report on the colloquium on recognition and alleviation of animal pain and distress. Journal of the American Veterinary Medical Association, 191:1186-1189.

AVMA. 1996. Position statement on abandoned and feral cats. AVMA Executive Board, July 19, 1996.

AVMA. 2004. Animal Welfare Forum: Management of Abandoned and Feral Cats. Journal of the American Veterinary Medical Association. Vol. 225, No. 9, November 1, 2004.

AVMA. 2013. AVMA guidelines on euthanasia. American Veterinary Medical Association. <https://www.avma.org/KB/Policies/Documents/euthanasia.pdf>. Accessed on 27 February 2017.

Apa, A.D., D. W. Uresk, and R. L. Linder. 1991. Impacts of Black-tailed Prairie Dog Rodenticides on Nontarget Passerines. In Great Basin Naturalist 51(4):301-309.

Bailey, T. N. 1971. Biology of striped skunks on a southwestern Lake Erie marsh. The American Midland Naturalist 85: 196–207.

Barrows, P. L. 2004. Professional, ethical, and legal dilemmas of trap-neuter-release. Journal of the American Veterinary Medical Association 225:1365–1369.

Beach, R. 1993. Depredation problems involving feral pigs. Pages 67-75 in C.W. Hanselka and J. F. Cadenhead (editors.) Feral Swine: A Compendium for Resource Managers. Texas Agricultural Extension Service, San Angelo.

Beasley, J. C., and O. E. Rhodes, Jr. 2008. Relationship between raccoon abundance and crop damage. Human-Wildlife Conflicts 2(2):248-259.

Beaver, B. V., W. Reed, S. Leary, B. McKieran, F. Bain, R. Schultz, B. T. Bennett, P. Pascoe, E. Shull, L. C. Cork, R. Francis-Floyd, K. D. Amass, R. Johnson, R. H. Schmidt, W. Underwood, G. W. Thorton, and B. Kohn. 2001. 2000 Report of the AVMA panel on euthanasia. Journal of the American Veterinary Medical Association 218:669-696.

Beran, G. W. 1994. Handbook of zoonoses. Boca Raton, FL, CRC Press. 1,168 pp.

Beringer, J., L. P. Hansen, J. A. Demand, J. Sartwell, M. Wallendorf, and R. Mange. 2002. Efficacy of translocation to control urban deer in Missouri: costs, efficiency, and outcome. Wildlife Society Bulletin 30:767-774.

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

Bevan, D.J., K.P. Chandroo, and R.D. Moccia. 2002. Predator control in commercial aquaculture in Canada. <http://www.aps.uoguelph.ca/aquacentre/files/misc-factsheets/Predator%20Control%20in%20Commercial%20Aquaculture%20in%20Canada.pdf.> Accessed 29 March 2012.

Bevin, S.N, K. Pedersen, M.W. Lutman, T. Gidlewski, T.J. Deliberto. 2014. Consequences Associated with the Recent Range Expansion of Non-native Feral Swine. Bioscience, 64(4), 291-299.

Bhat, M. G., R. G. Huffaker, S. M. Lenhart. 1993. Controlling forest damage by dispersive beaver populations: centralized optimal management strategy. Ecological Applications 3(3):518-530.

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

Boggess, E. K. 1994. Raccoons. *in* S. E. Hygnstrom, R. M. Timm and G. E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDA-APHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebraska, Pp C101-107

Boyce, P. S. 1998. The social construction of bereavement: an application to pet loss. Dissertation Abstracts International Section A: Humanities and Social Sciences. Vol 59(4-A). US: University Microfilms International. 1348pp.

Brundige, G. C. 1993. Predation ecology of the eastern coyote, *Canis latrans* var., in the Adirondacks, New York. Ph.D. Dissertation, State University of New York, Syracuse.

Broadfoot, J. D., R. C. Rosatte, and D. T. O'Leary. 2001. Raccoon and Skunk Population Models for Urban Disease Control Planning In Ontario, Canada. Ecological Applications, 11(1)295–303.

Burt, W. H., and R. P. Grossendeider. 1976. A field guide to the mammals. Houghton Mifflin Col, Boston. 289 pp.

Caron, M. 1986. Red Fox Species Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Castillo, D., AND A. L. Clarke. 2003. Trap/neuter/release methods ineffective in controlling domestic cat "colonies" on public lands. Natural Areas Journal 23:247–253.

CDC (Centers For Disease Control and Prevention). 2001a. Rabies prevention and control. Information obtained at website: http://www.cdc.gov/ncidod/dvrd/rabies.

CDC. 2001b. Mass treatment of humans who drank unpasteurized milk from rabid cows – Massachusetts, 1996-1998. CDC – Morbidity and Mortality Weekly Report. Information obtained from website: http://www.cdc.gov/ncidod/dvrd/rabies/Professional/MMWRtext/mmwr4811.htm.

CDC. 1990. Compendium of Rabies Control. Morbidity and Mortality Weekly Report. 39 No. RR-4:6.

CDC. 2017. Hantavirus Disease by State of Exposure. https://www.cdc.gov/hantavirus/surveillance/state-of-exposure.html

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

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

Chalfoun, A. D., F. R. Thompson and M. J. Ratnaswamy. 2002. Nest predators and fragmentation: a review and meta-analysis. Cons. Biol., 16:306–318.

Childs, J. E. 1986. Size dependent predation on rats by house cats in an urban setting. Journal of Mammalogy 67:196-198.

Childs, J. E. 1991. And the cats shall lie down with the rat. Natural History, June 100:16-19.

Churcher, P. B., and J. H. Lawton. 1987. Predation by domestic cats in an English village. J. Zool. (London) 212:439-455.

Churcher, P. B., and J. H. Lawton. 1989. Beware of well-fed felines. Natural History 7:40-46.

Clark, A. 1986. Fisher Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Cleary, E. C., S. E. Wright, and R. A. Dolbeer. 2000. Wildlife Strikes to civil aircraft in the United States 1990-1999 U.S. Dept. of Trans., Federal Aviation Admin. Ser. Rep. No.4. Washington, D.C. 61 pp.

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

Coleman, J. S., S. A. Temple, and S. R. Craven. 1997. Facts on cats and wildlife: a conservation dilemma. Misc. Publications. USDA Cooperative Extension, University of Wisconsin. http://wildlife.wisc.edu.

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

Conover, M. R. 1982. Comparison of two behavioral techniques to reduce bird damage to blueberries: Methiocarb and hawk-kite predator model. Wildl. Soc. Bull., 10,211-216.

Coulter, M. W. 1966. Ecology and management of fisher in Maine. Unpub. Ph.D. Diss., State University College of For., Syracuse University. 183pp. (Cited in Clark 1986).

Courchamp, F., J. L. Chapuis, M. Pascal. 2003. Mammal invaders on islands: impact, control and control impact. Biol Rev 78:347-383.

Craig, J.R., J.D. Rimstidt, C.A. Bonnaffon, T.K. Collins, and P.F. ScanIon. 1999. Surface water transport of lead at a shooting range. Bulletin of Environmental Contamination and Toxicology 63:312319.

Craven, S. R. and S. E. Hygnstrom. 1994. Deer. *in* S. E. Hygnstrom, R. M. Timm and G. E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDA-APHISADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebraska, Pp D25-40.

Cummings, L. 2003. Testimony to the Pennsylvania Game Commission, October 6, 2003. Alley Cat Allies. http://www.alleycat.org/pdf/pgccomments_lynn.pdf.

Dauphine, N. and R.J. Cooper. 2009. Impacts of Free-Ranging Domestic Cats on Birds in the United States: A Review of Recent Research with Conservation and Management Recommendations. Proceedings of the Fourth International Partners in Flight Conference: Tundra to Tropics. 205–219.

Davidson, W. R. and V. F. Nettles. 1997. Field manual of wildlife diseases in the southeastern United States. 2nd ed. The Univ. of Georgia, Athens, Georgia. 417pp.

Decker, E. 1978. Exotics. Pages 249–256 *in* Schmidt, J. L., and D. L. Gilbert, editors. Big game of North America: ecology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

Decker, D. J. and G. R. Goff. 1987. Valuing Wildlife: Economic and Social Perspectives. Westview Press. Boulder, Colorado, 424 p.

Decker, D. J. and K. G. Purdy. 1988. Toward a concept of wildlife acceptance capacity in wildlife management. Wildl. Soc. Bull. 16:53-57.

Decker, D.J., and L.C. Chase. 1997. Human dimensions of living with wildlife – a management challenge for the 21st century. Wildlife Society Bulletin 25:788-795.

Deisch, M. S. 1986. The effects of three rodenticides on nontarget small mammals and invertebrates. Unpublished thesis, South Dakota State University, Brookings. 149p.

Deisch, M. S., D. W. Uresk, R. L. Linder. 1989. Effects of two prairie dog rodenticides on grounddwelling invertebrates in western South Dakota. Pages 166-170 in Ninth Great Plains wildlife damage control workshop proceedings. USDA Forest Service General Technical Report RM-171. 181pp.

Deisch M.S., D.W. Uresk, and R. L. Linder. 1990. Effects of Prairie Dog Rodenticides on Deer Mice in Western South Dakota. Great Basin Naturalist 50(4):347-353.

DeVault, T.L., J.C. Beasley, L.A. Humberg, B.J. MacGowan, M.I. Retamosa, and O.E. Rhodes, Jr. 2007. Intrafield patterns of wildlife damage to corn and soybean in northern Indiana. Human-Wildlife Conflicts 1:179-187.

Dolbeer, R.A. 1998. Population dynamics: the foundation of wildlife damage management for the 21st century. Proceedings from the 18th Vertebrate Pest Conference, Davis, CA, 2-11pp.

Dolbeer, R.A., S.E. Wright, J. R. Weller, A.L. Anderson and M.J. Beiger. 2015. Wildlife Strikes to Civil Aircraft in the United States, 1990–2014. U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Safety and Standards, Serial Report No. 21, Washington, D.C., USA.

Dolbeer, R.A., J. R. Weller, A.L. Anderson and M.J. Beiger. 2016. Wildlife Strikes to Civil Aircraft in the United States, 1990–2015. U.S. Department of Transportation, Federal Aviation Administration, Office of Airport Safety and Standards, Serial Report No. 21, Washington, D.C., USA.

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

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

EPA 2000
http://water.epa.gov/action/advisories/drinking/upload/2009_02_03_criteria_humanhealth_microbial_giardiafs.pdf

Errington, P. L. 1933. Bobwhite winter survival in an area heavily populated with grey fox. Iowa State Coll. J. Sci. 8:127–130. Madison. 504pp.

Evans, J. 1970. About nutria and their control. USDI, Bureau of Sport, Fisheries and Wildlife, Resource Publication 86. 65p.

FAA (Federal Aviation Administration). 1997. Advisory circular No. 150/5200-33. Subject: hazardous wildlife attractants on or near airports. 10pp.

FAA. 2011. FAA National Wildlife Aircraft Strike Database 2006. US Dept. of Trans., Federal Aviation Admin. 800 Independence Avenue, SW Washington, DC 20591.
http://wildlife.pr.erau.edu/public/index1.html.

FDA (U.S. Food and Drug Administration). 2003. Bird poisoning of Federally protected birds. Office of Criminal Investigations. Enforcement Story 2003.
http://www.fda.gov/ora/about/enf_story/ch6/oci.htm.

Federal Emergency Management Agency (FEMA). 2005. Dam Owner's Guide to Animal Impacts on Earthen Dams. FEMA L-264.

Fergus, C. 2000. Porcupine. Wildlife of Pennsylvania and the Northeast. Pages 72-76.
Timm R.M., Slade N.A., Pisani G.R., Choate J.R., Kaufman G.A., Kaufman D.W. 2002. Mammals of Kansas. http://www.ksr.ku.edu/libres/mammals_of_kansas/list.html.

Fergus, C. 2001. Woodchuck. Wildlife Notes. PA Game Commission. http://www.nysenvirothon.net/woodchuck_1_.pdf

Figley, W. K., and L. W. VanDruff. 1982. The Ecology of Urban Mallards. Wildl. Monogr. 81.40pp

Fitzgerald, B. M. 1990: House cat. *In:* King, C. M. *ed.* The handbook of New Zealand mammals. Auckland, Oxford University Press. Pp. 330-348.

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

Fitzwater, W. D. 1994. Feral house cats. Pp C-45-50 in S. E. Hygnstrom, R. M. Timm and G. E. Larson, Eds., *Prevention and Control of Wildlife Damage.* Univ. Nebr. Coop. Ext., USDA-APHISADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Flyger, V. and J. E. Gates. 1982. Fox and Gray Squirrels. Pages 209-229 in J. A. Chapman and G. A. Feldhamer, eds. Wild Mammals of North America: biology, management, and economics. The John Hopkins Univ. Press, Baltimore.

Forestry Commission. 2012. Red Deer. Forestry Commission, Great Britain. http://www.forestry.gov.uk/forestry/reddeer.

Fowler, M. E. and R. E. Miller. 1999. Zoo and Wild Animal Medicine. W.B. Saunders Co. Philadelphia, PA

Gardner, A. L. 1982. Virginia opossum. Pp 3-36 in J. A. Chapman and G. A. Feldhamer, Eds., *Wild mammals of North America: biology, management, and economics*. Johns Hopkins Univ. Press, Baltimore, Maryland. 1147 pp.

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

Gerwolls, M. K. and Labott, S. M. 1994. Adjustment to the death of a companion animal. Anthrozoos 7(3): 172-187.

Gier, H. T. 1948. Rabies in the wild. J. Wildl. Manage. 12:142–153.

Gill, R. M. A. 1992. A Review of Damage by Mammals in North Temperate Forests. 2. Small Mammals. Forestry 65(3):281-308.

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

Gipson, P. S. 1983. Evaluations of behavior of feral dogs in interior Alaska, with control implications. Vertebr. Pest Control Manage. Mater. 4th Symp. Am. Soc. Testing Mater. 4:285-294.

Glover, F.A. 1942. A population study of weasels in Pennsylvania. M.S. Thesis, Pennsylvania State College.

Godin, A.J. 1977. Wild Mammals of New England. Johns Hopkins University Press. Baltimore, MD. 304pp.

Goldburg, R.J., M.S. Elliot, and R.L. Naylor. 2001. Marine Aquaculture in the United States. Prepared for the Pew Oceans Commission. <https://www.iatp.org/sites/default/files/Marine_Aquaculture_in_the_United_States_Enviro.pdf >. Accessed 29 March 2012.

Green, J. S., and P. S. Gipson. 1994. Feral dogs. Pp C-77-82 in S. E. Hygnstrom, R. M. Timm and G. E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDAAPHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Greenhall, A. M. and S. C. Frantz. 1994. Bats. Pp D5-24 in S. E. Hygnstrom, R. M. Timm and G. E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDAAPHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Griffith, D.M., and Alerich, C.L. 1996. Forest statistics for Maine 1995. U.S. For. Serv. Resour. Bull. NE135.

Grinnell, J., J. S. Dixon, and J. M. Linsdale. 1937. Fur-bearing mammals of California. 2 vols. Univ. California Press, Berkeley. 777pp.

Gurnell, J. 1987. The Natural History of Squirrels. Facts on File, Inc., New York.

Hallberg, D. L., And G. R. Trapp. 1984. Gray fox temporal and spatial activity in a riparian–agricultural zone in California's Central Valley. *in* R. E. Warner and K. M. Hendrix, Eds., Proc.Calif. Riparian Systems Conf., Univ. California Press, Berkeley, Pp 920–928.

Hamilton, W.J. 1939. Observations on the life history of the red squirrel in New York. American Midland Nat., 22:732-745.

Hardin, G. 1986. Cultural carrying capacity: a biological approach to human problems. Bioscience. 36(9):599-606.

Harlow, H. 2012. Muscle protein and strength retention by bears during winter fasting and starvation. Comparative physiology of fasting, starvation, and food limitation. P. 277-296. DOI: 10.1007/978-3-642-29056-5_17.

Harris, S. 1977. Distribution, habitat utilization and age structure of a suburban fox (*Vulpes vulpes*) population. Mammal Rev. 7: 25-39.

Harris, S, and J. M. V. Rayner. 1986. Urban fox *(Vulpes vulpe*s) population estimates and habitat requirements in several British cities. J. Anim. Eco*l*. 55:575–591.

Harrison, D. J., J. A. Bissonette, and J. A. Sherburne. 1989. Spatial Relationships between Coyotes and Red Foxes in Eastern Maine. The Journal of Wildlife Management. 53(1):181-185.

Harrison, D. J. 1992a. Social ecology of coyotes in northeastern North America: relationships to dispersal, food resources, and human exploitation. Pages 53-72 *in* A. H. Boer, ed. Ecology and management of the eastern coyote. Wildlife Research Unit, University of New Brunswick, Frederiction, N.B.

Hawkins, C. C., W. E. Grant, and M. T. Longnecker. 1999. Effect of subsidized house cats on California birds and rodents. Transactions of the Western Section of The Wildlife Society 35:29-33.

Hegdal, P.L. and T.A. Gatz. 1977. Hazards to pheasants and cottontail rabbits associated with zinc phosphide baiting for microtine rodents in orchards. Unpublished report, Denver Wildlife Research Center.

Hegdal, P.L., T.A. Gatz, and E.C. Fite. 1980. Secondary effects of rodenticides on mammalian predators, p. 1781-1793. In Worldwide Furbearer Conf. Proceedings, Vol. Ill (J.A. Chapman and D. Pursley, eds.) [Frostburg, Md., Aug. 3-11, 1980] 2056p.

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

Henderson, F.E. 1994. Weasels. pp C-119-122. in S. E. Hygnstrom, R. M. Timm and G. E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDA-APHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Hill, E.F. and J.W. Carpenter. 1982. Response of Siberian ferrets to secondary zinc phosphide poisoning. Journal of Wildlife Manage. 46(3).

Hoagland, J.W. 1993. Nuisance Beaver Damage Control Proposal. Okla. Dept. Wildl. Cons. Internal Document. 20 pp.

Hunt, J H. 1986a. Mink Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Hunt, J H. 1986b. River Otter Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Hunt, J H. 1986c. Muskrat Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Hunt, W.H., W. Burnham, C.N. Parish, K.K. Burnham, B. Mutch, and J.L. Oaks. 2009. Bullet fragments in deer remains: Implications for lead exposure in avian scavengers. Wildlife Society Bulletin 34:167-170.

Iverson, J. B. 1978. The impact of feral cats and dogs on a population of the West Indian rock iguana, *Cyclura carinata*. Biol. Conserv. 24:3-73.

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

Jackson, J. J. 1994a. Opossums. Pp D59-64 in S.E. Hygnstrom, R.M. Timm and G.E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDA-APHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Jackson, J. J.. 1994b. Tree squirrels. Pp B-171-175 in S.E. Hygnstrom, R.M. Timm and G.E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDA-APHISADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Jakubas, W. 1999. Coyote Species Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Jakubas, W. and R.Cross. 2002. Snowshoe Hare Assessment 2001. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Jessup, D. A. 2004. The welfare of feral cats and wildlife. Journal of the American Veterinary Medical Association 225:1377-1383.

Johnson, G. D. and K. A. Fagerstone. 1994. Primary and secondary hazards of zinc phosphide to nontarget wildlife - a review of the literature. USDA/APHIS/DWRC Research Report No. 11-55005.

Johnson, M. R., R. G. McLean, and D. Slate. 2001. Field Operations Manual for the Use of Immobilizing and Euthanizing Drugs. USDA, APHIS, WS Operational Support Staff, Riverdale, Maryland, USA.

Jonker, S. A., J. A. Parkhurst, R. Field, T. K. Fuller. 1998. Black bear depredation on agricultural commodities in Massachusetts. Wildlife Society Bulletin 26(2):318-324.

Kelley, G. M. 1977. Fisher (*Martes pennanti*) biology in the White Mountain National Forest and adjacent areas. Unpub. Ph.D. Diss., University of Massachusetts, Amherst. 178pp. (Cited in Clark 1986).

Kendall, R.J., T.E. Lacher, Jr., C. Bunck, B. Daniel, C. Driver, C.E. Grue, F. Leighton, W. Stansley, P.G. Watanabe, and M. Whitworth. 1996. An ecological risk assessment of lead shot exposure in nonwaterfowl avian species: Upland game birds and raptors. Environmental Toxicology and Chemistry 15:4-20.

Kennely, J. J., and B. E. Johns. 1976. The estrous cycle of coyotes. J. Wildl. Manage. 40:272-277.

Kern, W. H., Jr. 2002. Raccoons. WEC-34. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

King, C.M. 1989. The natural history of weasels and stoats. Cornell University Press. Ithaca, NY. 253pp.

Knowlton, F. F. 1972. Preliminary interpretations of coyote population mechanics with some management implications. J. Wildl. Manage. 36:369-383

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

Laidlaw, M.A., H.W. Mielke, G.M. Filippelli, D.L. Johnson, and C.R. Gonzales. 2005. Seasonality and children's blood lead levels: Developing a predictive model using climatic variables and blood lead data from Indianapolis, Indiana, Syracuse, New York, and New Orleans, Louisiana (USA). Environmental Health Perspectives 113:793-800.

Langbein, J. and N. Chapman. 2002. Fallow Deer. The Mammal Society, London and The British Deer Society, Fordingbridge.

Langham, N. P. E. 1990: The diet of feral cats (*Felis catus* L.) on Hawke's Bay farmland, New Zealand. New Zealand Journal of Zoology *17:* 243-255.

Latham, R.M. 1960. Bounties Are Bunk. Nat. Wildl. Federation, Wash., D.C. 10 pp.

Lavigne, G.R. 1999. White-tailed Deer Assessment and Strategic Plan. Maine Department of Inland Fisheries and Wildlife, Augusta, Maine.

Layne, J.N. 1954. The biology of the red squirrel in central New York. Ecol. Monogr., 4:227-267.

Lefrancois, G. R. 1999. Bereavement and grieving, pp. 552-554. in The Lifespan. 6th ed. Wadsworth. 556pp.

Leopold, A. S. 1933. Game Management. Charles Scribner & Sons, NY, NY. 481 pp.

Liberg, O. 1984. Food habits and prey impact by feral and house based domestic cats in a rural area in southern Sweden. Journal of Mammalogy. 65:424-432.

Lord, R. D., Jr. 1961. A population study of the gray fox. Am. Midl. Nat. 66:87–109. Sci. 38.79–82.

Loss, S. R., T. Will, and P.P. Marra. 2013. The impact of free-ranging domestic cats on wildlife of the United States. Nature Communications. Vol. 4, Art. 1396.

Lowry, D. A. 1978. Domestic dogs as predators on deer. Wildl. Soc. Bull. 6:38-39.

MacDonald, D. W., and M. T. Newdick. 1982. The distribution and ecology of fox, *Vulpes vulpes* (L.), in urban areas. Pages 123–135 in R. Bornkamm, J. A. Lee, and M. R. D. Seaward, Eds., *Urban ecology*. Blackwell Sci. Publ., Oxford, U.K.

Maine Dept. of Inland Fisheries & Wildlife. 2009. How to Avoid Incidental Take of Lynx, while Trapping or hunting Bobcats and other Furbearers. Produced by USFWS & IAFWA and modified by MDIFW in 2003, 2005, and updated in 2009. http://www.maine.gov/ifw/wildlife/management/lynx_avoid.htm

Maine Dept. of Inland Fisheries & Wildlife. 2010. Wildlife Division Research and Management Report. http://www.maine.gov/ifw/wildlife/surveys_reports/research_management/index.htm

Maine Dept. of Inland Fisheries & Wildlife. 2012. Research and Management Report 2012. Http://www.maine.gov/ifw/wildlife/surveys_reports/research_management/pdfs/2012 .

Maine Dept. of Inland Fisheries & Wildlife. 2013. Northern Bog Lemming. Maine Endangered Species Program http://www.maine.gov/ifw/wildlife/species/endangered_species/northern_bog_lemming/

Maine Department of Health and Environmental Testing Laboratory. 2003. Positive rabies cases in Maine 1933-2003 and notes on the history of rabies in Maine. Maine Department of Health and Environmental Testing Laboratory, Rabies Section. Augusta, Maine, USA.

Majumdar, S.K., J.E. Huffman, F.J. Brenner, and A.I. Panah. 2005. Wildlife Diseases: Landscape Epidemiology, Spatial Distribution and Utilization of Remote Sensing Technology. The Pennsylvania Academy of Sciences.

Malamuth, E. and M. Mulheisen. 1999. "Glaucomys sabrinus" (On-line), Animal Diversity Web. Accessed March 17, 2011. http://animaldiversity.ummz.umich.edu/site/accounts/information/Glaucomys_sabrinus.html.

Manski, D. M., L. W. VanDruff, and V. Flyger. 1981. Activities of gray squirrels and people in a downtown Washington, D.C. park: management implications. Trans. North Amer. Wild. Nat. Res. Conf. 46:439-454.

Marks, S. G., and J. E. Koepke. 1994. Pet attachment and generativity among young adults. *J. Psychology* 128(6): 641.

Martin, R. 2009. L.D. 2288 – Resolve to Create a Deer Predation Working Group. A Report to the Joint Standing Committee on Inland Fisheries and Wildlife. http://www.maine.gov/ifw/wildlife/surveys_reports/pdfs/deerpredationreport.pdf

Mayer, J. J., R. E. Hamilton, and I. L. Brisbin. 2009. Use of trained hunting dogs to harvest or control wild pigs. Pages 263–275 *in* Mayer, J. J., and I. L. Brisbin, Jr, editors. Wild pigs: Biology, damage, control techniques and management. SRNL-RP-2009-00869. Savannah River National Laboratory, Aiken, South Carolina, USA: in press.

McKnight, T. 1964. Feral livestock in Anglo-America. Univ. Calif. Publ. Geogr., Vol. 16. Univ. Calif. Press, Berkeley.

McLaughlin, C. R. 1999. Black Bear Assessment and Strategic Plan. Dept. of Inland Fisheries and Wildlife, 650 State Street, Bangor, ME 04401.

Meltzer, M. I. 1996. Assessing the costs and benefits of an oral vaccine for raccoon rabies: a possible model. *Emerging Infectious Diseases* 2(4):343-349.

Meyers, B. 2000. Anticipatory mourning and the human-animal bond. Pp 537-564 in Rando, Therese A. Ed., Clinical dimensions of anticipatory mourning: Theory and practice in working with the dying, their loved ones, and their caregivers. Champaign, IL, US: Research Press. xiii, 601 pp.

Morris, K.I. 1986. Bobcat Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Morris, K.I. 1999. Moose Assessment. Maine Department of Inland Fisheries and Wildlife. Bangor, ME.

Mosillo, M., E. J. Heske, and J. D. Thompson. 1999. Survival and Movements of Translocated Raccoons in Northcentral Illinois. The Journal of Wildlife Management 63(1):278-286.

Musante, A.R., K. Pedersen, and P. Hall. 2014. First reports of pseudorabies and winter ticks associated with an emerging feral swine population in New Hampshire. Journal of Wildlife Disease; 50(1):121-4.

NASS (National Agricultural Statistics Service). 1997. Agricultural Statistics Annual. http://www.nass.usda.gov/Publications/Ag_Statistics/1997/index.asp

NASS (National Agricultural Statistics Service). 2002. U.S. Wildlife Damage. U.S. Dept. Agric., Natl. Agric. Statistics Serv., Washington, DC.

NASS. 2006. Cattle death loss. U.S. Dept. Agric., Natl. Agric. Statistics Serv., Washington, DC.

NASS. 2009. Sheep and Goats Death Loss. http://usda.mannlib.cornell.edu/usda/current/sgdl/sgdl-0527-2010.pdf.

National Audubon Society. 2000. Field guide to North American mammals. J. O. Whitaker, Jr., ed. Indiana State Univ. Alfred A. Knopf, New York, N.Y. 937pp.

New England Agricultural Statistics Service. 2001. Camelid and Cervidae Farms. 1997 Census of Agriculture. http://www.nass.usda.gov/nh/llamasdeer2.pdf

National Agricultural Statistics Service (NASS). 2011. Cattle death loss 2010. Released May 12, 2011. USDA, National Agricultural Statistics Service, Washington, DC. <http://usda.mannlib.cornell.edu/usda/current/CattDeath/CattDeath-05-12-2011.pdf >. Accessed 25 September 2013.

Nielsen, L. 1988. Definitions, considerations, and guidelines for translocation of wild animals. Pp 12-51 in L. Nielsen and R. D. Brown, eds. Translocation of wild animals. Wis. Humane Soc., Inc., Milwaukee and Caesar Kleberg Wildl. Res. Inst., Kingsville, TX. 333pp.

Noah, D.L., M.G. Smith, J.C. Gotthardt, J. W. Krebs, D. Green, and J.E. Childs. 1995. Mass human exposure to rabies in New Hampshire: Exposures, Treatment, and cost. Public Health Briefs, National Center for Infectious Diseases, 1600 Clifton Rd. Mailstop G-13, Atlanta, GA 30333. 3 pp.

Nupp, T.E., and R.K. Swihart. 1998. Effects of Forest Fragmentation on Population Attributes of WhiteFooted Mice and EasternChipmunks. Journal of Mammalogy. 79, (4)1234-1243.

Noyce, K. 2012. Summary of State/Provincial Status Reports. Proceedings of the 20th Eastern Black Bear Workshop, edited by C. Olfenbuttel and G. Warburton. Hendersonville, North Carolina.

Okey, C. 1971. Rabies in Maine, 1971. The Journal of the Maine Medical Association. 62,9: 228-229.

Organ, J. F., J. H. Vashon, J. E. McDonald Jr., A. D. Vashon, S. M.Crowley, W. J. Jakubas, G. J. Matula, Jr., and A. L. Meehan. 2008. Within-Stand selection of Canada lynx natal dens in northwest, Maine, USA. Journal of Wildlife Mangement 72(7):1514-1517. DOI: 10.2193/2008-290.

Palmer, R.S. 1954. The Mammal Guide. Doubleday and Company, Inc. Garden City, N.Y.

Parkes, C. M. 1979. Grief: the painful reaction to the loss of a loved one. Monograph. University of California, San Diego.

Pearson, O.P. 1964. Carnivore-mouse predation: an example of its intensity and bioenergetics. Journal of Mammalogy 45:177–188

Pearson, O. P. 1971. Additional measurements of the impact of carnivores on California voles (*Microtus californicus*). Journal of Mammology 52:41–49.

Pelton, M. R. 2003. Black bear. Page 504-514 in J.A. Chapman and G.A. Feldhammer, editors. Wild mammals of North America: biology, management, and economics. The John Hopkins University Press, Baltimore, Maryland, USA.

Phillips, R. L. 1970. Age ratio of Iowa foxes. J. Wildl. Manage. 34:52-56.

Phillips, R. L., and R. H. Schmidt. 1994. Fox. Pp C-83-88 in S.E. Hygnstrom, R.M. Timm and G.E. Larson, eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDAAPHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Pimentel, D., Zuniga, R., Morrison, D. 2005. Update on the Environmental and Economic Costs Associated with Alien-Invasive Species in the United States. Ecological Economics 52(2005)273-288.

Pratte, J. and S. Ritchie. 2011. Deer Progress Report: Maine's Game Plan for Deer. Maine Hunting and Trapping the Official 2011-2012 State of Maine Hunting and Trapping Laws and Rules. http://www.eregulations.com/maine/hunting/deer-progress-report/

Ramey, C. A., Bourassa, J. B., Brooks, J. E. 2000. Potential risks to ring-necked pheasants in California agricultural areas using zinc phosphide. Int. Biodeter. Biodegrad 45:223-230.

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

Reitsma, L. R., Holmes, R. T. and Sherry, T. W. 1990. Effects of removal of red squirrels, and eastern chipmunks, on nest predation in a northern hardwood forest: an artificial nest experiment. Oikos 57: 375-380.

Riley, S. P., D. J. Hadidian, and D. A. Manski. 1998. Population density, survival, and rabies in raccoons in an urban national park. Canadian Journal of Zoology. 76:1153–1164.

Ritter, A. 1986. Marten Assessment. Maine Department of Inland Fisheries & Wildlife. 284 State St. Augusta, ME.

Rosatte, R. C. 1987. Skunks. Pp. 599-613 in M. Novak, J. A. Baker, M.E. Obbard, B. Mallock, eds., Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario, Canada. 1150 pp.

Ross, C. B., and J. Baron-Sorensen. 1998. Pet loss and human emotion: guiding clients through grief. Accelerated Development, Inc. Philadelphia, PA. 166 pp.

Sanderson, G. C. 1987. Raccoons. Pp. 486-499 in M. Novak, J. A. Baker, M.E. Obbard, B. Mallock, eds., Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario, Canada. 1150 pp.

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

Scott, M. D., and K. Causey. 1973. Ecology of feral dogs in Alabama. J. Wildl. Manage. 37:253-265.

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

Seidensticker, J., M. A. O'Connell, and A. J. T. Johnsingh. 1987. Virginia Opossum. Pages 247-261 in M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resour., Ontario Trappers Assoc., North Bay.

Sieving, K. E., and M. F. Wilson. 1998. Nest predation and avian species diversity in northwestern forest understory. Ecology 79:2391–2402.

Simms, D.A. 1979. Studies of an ermine population in Ontario. Can. J. Zool. 57:824-32.

Slate, D. 1980. A study of New Jersey raccoon populations— determination of the densities, dynamics and incidence of disease in raccoon populations in New Jersey. N.J. Div. Fish, Game, and Wildl., Pittman-Robertson Proj. W-52-R-8, Final Rep. 67pp.

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

Slater, M.R. 2004. Understanding issues and solutions for unowned, free-roaming cat populations. Journal of the American Veterinary Medical Association 225:1350-1354.

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

Stansley, W., L. Widjeskog, and D. E. Roscoe. 1992. Lead contamination and mobility in surface water at trap and skeet Ranges. Bulletin of Environmental Contamination and Toxicology 49:640-647.

Stephens, D. L. and R. P. Hill. 1996. The loss of animal companions: A humanistic and consumption perspective. Society & Animals. Vol 4(2): 189-210.

Stoskopf, M.K., and F. B. Nutter. 2004. Analyzing approaches to feral cat management-one size does not fit all. JAVMA 225:1361-1364.

Stowell, L. R., and R. C. Willging. 1992. Bear damage to agriculture in Wisconsin. Eastern Wildlife Damage Control Conference. Paper 44.

Sullivan, K. L., and M. Hilbert. 2014. Rabbits of New York. <https://blogs.cornell.edu/cerp/files/2014/05/Cottontail-012015-2jig7cl.pdf>. Accessed 29 March 2017.

Sweeney, J. M., and J. R. Sweeney. 1982. Feral hog. Pages 1099–1113 *in* J. H. Chapman and G. A. Feldhamer, editors. Wild mammals of North America: biology, management, and economics. Johns Hopkins University Press, Baltimore, Maryland, USA.

Taylor, R. B. 2003. The feral hog in Texas. Texas Parks and Wildlife, Austin, Texas, USA. Unnumbered publication. Accessed online at: http://www.tpwd.state.tx.us/huntwild/wild/nuisance/feral_hogs.

The Wildlife Society and American Fisheries Society. 2008. Sources and implications of lead ammunition and fishing tackle on natural resources. Technical Review 08-01. June 2008. 68p.

The Wildlife Society. 2010. Final Position Statement: Wildlife Damage Management. The Wildlife Society. Bethesda, MD. 2p.

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

Tietjen, H. P. 1976. Zinc phosphide: its development as a control agent for black-tailed prairie dogs. Spec. Sci. Rep.--Wildl. No. 195, USFWS, Washington, DC. Unpublished Report, Denver Wildlife Research Center.

Tietjen, H.P., and G. H. Matschke. 1982. Aerial prebaiting for management of prairie dogs with zinc phosphide. Journal of Wildlife Management 46:1108-1112.

Timm, R. M., Baker, R. O., Bennett, J. R. and Coolahan, C. C. 2004. Coyote Attackes: An Increasing Urban Problem. Presented at 69th North American Wildlife and Natural Resources Conference, Spokane, WA. March 16–20 2004.

Trapp, G. R. 1978. Comparative behavioral ecology of the ringtail *(Bassariscus astutus*) and gray fox *(Urocyon cinereoargenteus*) in southwestern Utah. Carnivore 1(2):3–32.

Twichell, A. R., and H. H. Dill. 1949. One hundred raccoons from one hundred and two acres. Journal of Mammalogy. 30:130–133.

USBC. 2001. Statistical Abstract of the United States 2001. Washington, DC: U.S. Bureau of the Census, U.S. Government Printing Office.

USDA. 1989. USDA, Animal and Plant Health Inspection Service, Animal Damage Control Strategic Plan. USDA, APHIS, ADC, Operational Support Staff, 4700 River Road, Unit 87, Room 2D05, Riverdale, MD 20782.

USDA. 2001. Environmental Assessment Oral Vaccination To Control Specific Rabies Virus Variants in Raccoons, Gray Fox, and Coyotes in the United States. USDA, APHIS, WS, 4700 River Road, Unit 87, Room 2D05, Riverdale, MD 20782.

USDA. 2005. Supplemental Environmental Assessment: Oral Vaccination To Control Specific Rabies Virus Variants in Raccoons, Gray Fox, and Coyotes in the United States. USDA, APHIS, WS, 4700 River Road, Unit 87, Room 2D05, Riverdale, Maryland 20782.

USDA. 2007. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services' Management Information System (MIS) database. Accessed September 19, 2007.

USDA. 2009. The 2007 Census of Agriculture: Maine State and County Data. Washington, D.C. 459pp.

Information obtained from website: http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Maine/mev1.pdf

USDA. 2010. Cooperative Rabies Management Program Report. USDA, APHIS, WS 79 Leighton Rd., Suite 12, Augusta, ME 04330.

USDA. 2012. Environmental Assesment: Reducing the Effects of Predation on Threatened and Endangered Birds in the State of Maine. USDA, APHIS, WS, 79 Leighton Rd, Suite 12, Augusta, ME 04330.

United States Environmental Protection Agency (USEPA). 2005. Ecological soil screening levels for lead – Interim final. OSWER Directive 9285.7-70. USEPA Office of Solid Waste and Emergency Response. 242p. <https://www.epa.gov/sites/production/files/documents/epa_bmp.pdf>.

USEPA. 2013. Integrated Science Assessment for lead, EPA/600/R-10/075F, Office of Research and Development, National Center for Environmental Assessment, Research Triangle Park, NC, June 2013.

United States Fish and Wildlife Service (USFWS). 2001. Inside Region 3: Ohio man to pay more than $11,000 for poisoning migratory birds. Volume 4(2):5.

U.S. Fish and Wildlife Service. 2001a. Mammals (brochure). Rachel Carson National Wildlife Refuge. Wells, ME. Information obtained from website: http://www.fws.gov/northeast/rachelcarson/pdf/mammals.pdf

USFWS. 2007. National Bald Eagle Management Guidelines.

USFWS 2007. U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: State Overview, Preliminary Findings. Information obtained from website: http://library.fws.gov/nat_survey2006_state.pdf.

USFWS 2011. Fisher. Endangered Species, Mountain Prairie Region. http://www.fws.gov/mountainprairie/species/mammals/fisher/.

USFWS and NRCS. 2011. New England Cottontail. http://www.fws.gov/northeast/indepth/rabbit/pdf/NECottontailfactsheet062011.pdf

USFWS. 2012. Canada Lynx-Threatened. Maine Field Office, Ecological Services. http://www.fws.gov/mainefieldoffice/Canada_lynx.html

Uresk, D. W., R. M. King, A. D. Apa, M. S. Deisch, and R. L. Linde. 1988. Rodenticidal effects of zinc phosphide and strychnine on nontarget species. 8h Great Plains wildlife damage control workshop proceedings, Rapid City, South Dakota, 28-30 April 1987. USDA Forest Service General Technical Report RM-154.

Vashon, J. 2010. Moose. Maine Department of Inland Fisheries and Wildlife. http://www.maine.gov/ifw/wildlife/species/moose/index.htm.

Vashon, J., S. McLellan, S. Crowley, A. Meehan, and K. Lausten. 2012. Canda Lynx Assessment. MDIFW, Research & Assessment Section, Bangor, ME 04401.

http://www.maine.gov/ifw/wildlife/pdfs/Lynx%20Assessment%202012_1_Final.pdf

Virchow, D. and D. Hogeland. 1994. Bobcats. Pp. C35-45 in S.E. Hygnstrom, R.M. Timm and G.E. Larson, eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDAAPHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr.

Voigt, D. R. 1987. Red fox. Pp 378-392 in M. Novak, J. A. Baker, M.E. Obbard, B. Mallock, eds., Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario, Canada. 1150 pp.

Voigt, D. R, and R. L. Tinline. 1980. Strategies for analyzing radio tracking data. Pp 387–404 in C. J. Amlaner, Jr., and D. W. Macdonald, eds., A handbook on biotelemetry and radio tracking. Pergamon Press, Oxford, U.K.

Voigt, D. R, and B. D. Earle. 1983. Avoidance of coyotes by red fox families. J. Wildl. Manage. 47:852–857.

Voigt, D. R, and W. E. Berg. 1987. Coyote. Pp 345-357 in M. Novak, J. A. Baker, M.E. Obbard, B. Mallock, eds., Wild Furbearer Management and Conservation in North America. Ministry of Natural Resources, Ontario, Canada. 1150pp.

Wagner, K. K., R. H. Schmidt, and M. R. Conover. 1997. Compensation Programs for Wildlife Damage in North America. USDA National Wildlife Research Center - Staff Publications. Paper 829.

Weisman, A. D. 1991. Bereavement and companion animals. Omega: Journal of Death & Dying. 22(4): 241-248.

West, B. C., A. L. Cooper, and J. B. Armstrong. 2009. Managing wild pigs: A technical guide. HumanWildlife Interactions Monograph 1:1–55.

Winter, L. 2004. Trap-neuter-release programs: the reality and the impacts. Journal of the American Veterinary Medical Association 225:1369-1376.

WWHC (Western Wildlife Health Committee). *Undated*. A model protocol for purchase, distribution,and use of pharmaceuticals in wildlife. Western Association of Fish and Wildlife Agencies. Contact: J. deVos, AZ Game and Fish Dept., 2221 W. Greenway Rd., Phoenix, AZ 85023. 9 p.

White, D.H., L.E. Hayes, and P.B. Bush. 1989. Case histories of wild birds killed intentionally with famphur in Georgia and West Virginia. Jounal of Wildlife Diseases. 25:144-188.

Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips, E. Losos. 1998. Quantifying threats to imperiled species in the United States.BioScience 48: 607–615.

Wildlife Management Institute. 2012. New England Cottontail. http://www.newenglandcottontail.org/natural-history/breeding-lifespan

Wildlife Society, The, 1990. Conservation Policies of the Wildlife Society. The Wildl. Soc., Wash., D.C. 20 pp.

Wildlife Society, The. 2010. Final TWS Position Statement: Feral and Free-Ranging Domestic Cats. Bethesda, MD

Williams, D.E. and R.M. Corrigan. 1994. Chipmunks *in* S. E. Hygnstrom, R. M. Timm and G. E. Larson, Eds., Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext., USDAAPHIS-ADC, and Great Plains Agric. Council Wildl. Comm., Lincoln, Nebr. B 13-16.

Yeager, L. E., and R. G. Rennels. 1943. Fur yield and autumn foods of the raccoon in Illinois river bottom lands. J. Wildl. Manage. 7:45–60.

Yeates, J. 2010. Ethical aspects of euthanasia of owned animals. In Practice 32(2):70-73.

Zasloff, R. L. 1996. Human-animal interactions. Special Issue. Applied Animal Behaviour Science. 47(1-2): 43-48.

APPENDIX B

MAMMAL DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDED BY THE MAINE WILDLIFE SERVICES PROGRAM

The most effective approach to resolving wildlife damage problems is to integrate the use of several methods, either simultaneously or sequentially. An Integrated Wildlife Damage Management (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 and deterrents, and population management, or any combination of these, depending on the characteristics of specific damage problems.

In selecting damage management techniques for specific damage situations, consideration is given to the responsible species and 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.

Nonchemical Wildlife Damage Management Methods

Nonchemical management methods consist primarily of tools or devices used to repel, capture or kill a particular animal or local population of wildlife to alleviate damage and conflicts. Methods may be 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, an *Agreement for Control on Private Property* must be signed by the landowner or administrator authorizing the use of each damage management method. Non-chemical methods used or recommended by WS include:

Exclusion pertains to preventing access to resources through fencing or other barriers. Fencing of small critical areas can sometimes prevent animals which cannot climb from entering areas of protected resources. Fencing, especially if it is installed with an underground skirt, can prevent access to areas for many mammal species which dig, including fox, feral cats, and striped skunks. Areas such as airports, yards or hay meadows may be fenced. Hardware cloth or other metal barriers can sometimes be used to prevent girdling and gnawing of valuable trees and to prevent the entry of mammals into buildings through existing holes or gaps. Exclusion and one-way devices such as netting or nylon window screening can be used to exclude bats from a building or an enclosed structure (Greenhall and Frantz 1994). Electric fences of various constructions have been used effectively to reduce damage to various crops by deer, raccoons, and other species (Craven and Hygnstrom 1994, Boggess 1994).

Cultural Methods and Habitat Management includes the application of practices which seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs, herders, shed lambing, carcass removal, or pasture selection. Strategies may also include minimizing cover where damaging mammals might hide,

manipulating the surrounding environment through barriers or fences to deter animals from entering a protected area, or planting lure crops on fringes of protected crops. Removal of trees from around buildings can sometimes reduce damage associated with raccoons.

Some mammals which cause damage in urban environments are attracted to homes by the presence of garbage or pet food left outside and unprotected. Removal or sealing of garbage in tight trash receptacles, and elimination of all pet foods from outside areas can reduce the presence of unwanted mammals. If raccoons are a problem, making trash and garbage unavailable, and removing all pet food from outside during nighttime hours can reduce their presence.

Beaver dam removal may be recommended or executed by WS. Removing beaver dams not only restores natural hydrology, but it also often alleviates the damage associated with flooding, which may impact roads and private property. Hand tools would be utilized by WS to breach or remove beaver dams. In every dam removal situation, WS consults with State biologists or game wardens in accordance with the guidance MDIFW provides on the removal of beaver dams and discharge of water in Maine as described in the "Administrative Policy Regarding Human and Wildlife Conflicts" (MDIFW 2015):
Modification or removal of beaver dams as authorized by a regional wildlife biologist or game warden, as long as (Natural Resources Protection Act, 38 MRSA §480-Q.21):

a. *Efforts are made to minimize erosion of soil and fill material from disturbed areas into a protected natural resource;*
b. *Efforts are made to minimize alteration of undisturbed portions of a wetland or water body; and*
c. *Wheeled or tracked equipment is operated in the water only for the purpose of crossing a water body to facilitate removal of the beaver dam. Where practicable, wheeled or tracked equipment may cross a water body only on a rock, gravel or ledge bottom. This exemption includes the draining of a freshwater wetland resulting from removal of a beaver dam. It does not include removal of a beaver house. Beaver flooded woodlands or other timberland may be drained by the removal of a dam after consultation with the regional wildlife biologist or warden. Approval will be given when timber is at imminent risk of loss, after waterfowl young-of-the-year have fledged and when the flowage is less than two years old*

Lure crops/alternate foods are crops planted or other food resources provided to mitigate the potential loss of higher value crops

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). Devices used to modify behavior in mammals include:

- electronic guards (siren strobe-light devices)
- propane exploders
- pyrotechnics
- laser lights
- human effigies
- harassment / shooting into groups

Live-capture and Translocation can be accomplished through the use of cage traps, snares, and foothold traps to capture some species of mammals for the purpose of translocating them for release to wild sites. WS does not usually use this method to conduct MDM programs in Maine because the MDIFW opposes relocation of rabies vector species in Maine. Live-capture and handling of wild mammals poses an additional level of human health and safety threat if target animals are aggressive, large, or extremely sensitive to the close proximity of humans. For that reason, WS may limit this method to specific situations and certain species.

Excessive populations may make this a poor wildlife management strategy for some species. In addition, moving damage-causing individuals to other locations can typically result in damage at the new location, or the translocated individuals can move from the relocation site to areas where they are unwanted. The AVMA, the National
Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission, particularly for small mammals such as raccoons or skunks (CDC 1990). Although relocation is not necessarily precluded in all cases, it would in many cases be logistically impractical and biologically unwise in Maine, and is evaluated by WS on a case-by-case basis.

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

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

Foothold traps are constantly being modified and tested to improve animal welfare of captured animals. In 1996, the Association of Fish and Wildlife Agencies began an historic research program to develop Best Management Practices (BMP) for trapping devices. The program aims to improve and modernize the technology of trapping through research that evaluates animal welfare, identifies efficient tools and techniques; and develops recommendations for state fish and wildlife agencies to consider as an element of their management programs. To date, 17 BMPs have been produced. All foothold traps used in the Maine WS program would comply with BMP standards. The foothold traps identified and used in the Maine program include the use of Woodstream Victor Number 3 padded-jaw coil spring for coyotes, and Woodstream Victor Number 1.5 padded-jaw coil spring for foxes. Other possible traps such as, but not limited to the MB450 and the MB550-RC may also be used. As new foot-hold traps are developed, WS may test and use these traps during activities.

Cable foot restraints are traps made of a spring that can be triggered to release a light cable with a locking device that closes around the foot of a medium to large sized mammal. The cable is placed in the path of an animal in the form of a loop. Once captured the animal is held, until the time of trap check, at which time a target species can be translocated or euthanized. A nontarget species can be released.

Cable devices/restraints (also known as snares) are traps made of light cable with a locking device and may be used as either lethal or live-capture devices. They are placed wherever an animal moves through a restricted area (*e.g.*, crawl holes under fences, trails through vegetation) and are easier to keep operational during periods of inclement weather than foothold traps. 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, cable restraints are equipped with integrated stops that permit snaring, but do not choke the animal and allows nontargets such as white-tailed deer to release itself. Careful attention to details when placing cable devices can result in avoiding nontarget captures.

Maine WS is not currently allowed to use cable devices on land (only underwater for beaver) per MDIFW policy, but could use them on federally owned land, although none have been used to date. In the future, WS expects that non-lethal (restraining) cable devices will be approved by MDIFW for use by WS. These

devices have been scientifically evaluated as live-capture devices and meet the criteria of Best Management Practices for Trapping in the United States (Association of Fish and Wildlife Agencies 2006). Target animals live-captured in restraining cables would be euthanized, while nontargets would be released.

Cage traps are live-capture traps used to trap a variety of small to medium sized mammals. Cage traps come in a variety of sizes and 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 being trapped.

Suitcase Traps such as the Hancock-style are used for live capturing beaver. The trap is placed in the water and once it is activated, the trap closes like a suitcase and envelops the beaver inside the steel cage enclosure.

Culvert traps are live-capture traps that are typically utilized for bears. The back of the trap is baited, and the front of the trap has an open door when set. As the bear reaches the back of the trap and pulls on the bait, the door is activated and closes shut. The bear is contained until the trap is checked and the animal can be translocated or euthanized.

Specialized raccoon foot traps are traps designed specifically to capture raccoons. These traps (*e.g.*, Coon Cuffs, Little Griz) are baited, specialized foot traps that are placed into the ground. The trap consists of a small box or tube measuring about 3 – 3 1/2 inches square. There is a small hole about 1 ¼ inches in diameter that a raccoon places its paw into to grab the fish or sweet bait. The specialized trap captures the raccoon's foot when it pulls a lever holding the food. These traps are highly selective and humane for capturing raccoons and opossums. Captured raccoons and opossums would be euthanized.

Body-gripping (e.g., Conibear-type) Traps are designed to cause the quick death of the animal that activates the trap. Placement is at burrow entrances created or used by the target species. For beavers, traps are placed underwater in areas that they frequently swim. The animal captured as it travels through the trap and activates the triggering mechanism. Safety hazards and risks to humans are usually related to setting, placing, checking, or removing the traps.

Weasel Boxes/Snap Traps are used to target long-tailed weasels, short-tailed weasels, and chipmunks. These traps consist of either a home-made wooden box (6"x5.5"x18") or plastic bait station box (3.5"x8"x13") (Liphatech Inc., Milwaukee, WI) that is used to hold common rat-sized snap traps and limit the entry of larger animals by using an entrance hole of 2.2" or less. Ratsized snap traps are designed to quickly and humanely kill the target animals and meet BMP criteria for trapping weasels. In some cases, snap traps may be used separate from weasel boxes depending on the site characteristics.

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

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.

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

checking traps, decreasing fuel usage, prioritizing trap checks, and decreasing the need for human presence in the area. Trap monitors could be used when using traps.

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

Shooting is selective for target species and may involve the use of spotlights and either a handgun, shotgun or rifle. Shooting is an effective method to remove a small number of mammals in damage situations, especially where trapping is not feasible. 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. WS personnel receive firearms safety training to use firearms that are necessary for performing their duties.

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

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

Chemical Wildlife Damage Management Methods

All pesticides used by WS are registered under the FIFRA and administered by the EPA and Maine Department of Agriculture Board of Pesticides Control. All WS personnel in Maine who apply restricteduse pesticides are certified pesticide applicators by MDABPC and have specific training by WS for WDM pesticide application. The EPA and MDABPC require pesticide applicators to adhere to all certification requirements set forth in the FIFRA. Pharmaceutical drugs, including those used in wildlife capture and handling, are administrated by FDA and/or DEA.

No chemicals are used by WS on public or private lands without authorization from the land management agency or property owner or manager. The following chemical methods have been proven to be selective and effective in reducing damage by mammals.

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calms fear, and allay anxiety. Ketamine is possibly the most

versatile drug for chemical capture, and it has a wide safety margin (Fowler and Miller 1999). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

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

Telazol (tiletamine and zolazepam) is another 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. Telezol produces extensive muscle tension in dogs, but produces a more relaxed anesthesia in coyotes, wolves, and bears. It is often the drug of choice for these wild species (Fowler and Miller 1999).

BAM is a combination of Butorphanol tartrate, Azaperone tartrate, and Medetomidine hydrochloride used for a broad range of species. BAM provides smooth induction times, as well as quick reversal times. BAM is potent in small volume quantities, which make it effective for immobilizing wildlife remotely by a dart. Animals that are administered BAM have superior muscle relaxation and a good anesthetic plane which facilitates handling and data collection.

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 animal that is very manageable and in a good state of analgesia. Medetomidine sedative effects can be reversed by yohimbine, tolazoline, or atipamezole.

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

Naltrexone (Naltrexone HCL) is an antagonism of any opiate sedation in any species. High doses of naltrexone are an effective tool in reducing or preventing renarcotization. Naltrexone is a pure opioid antagonists, therefore it has a high therapeutic indices.

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.

Sodium Pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. There are DEA restrictions on who can possess and administer this drug. Some states may have additional requirements for personnel training and particular sodium pentobarbital products available for use in wildlife. Certified WS personnel are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with DEA and state regulations.

Potassium Chloride used in conjunction with prior general anesthesia is used as a euthanasia agent for animals, and is considered acceptable and humane by the AVMA (Beaver 2001). Animals that have been euthanized with this chemical experience cardiac arrest followed by death, and are not toxic to predators or scavengers.

Beuthanasia-D combines pentobarbital with another substance to hasten cardiac arrest. Intravenous (IV) and intracardiac (IC) are the only acceptable routes of injection. As with pure sodium pentobarbital, IC injections with Beuthanasia-D are only acceptable for animals that are unconscious or deeply anesthetized. With other injection routes, there are concerns that the cardiotoxic properties may cause cardiac arrest before the animal is fully unconscious. It is a Schedule III drug, which means it can be obtained directly from the manufacturer by anyone with a DEA registration. However, Schedule III drugs are subject to the same security and record-keeping requirements as Schedule II drugs.

CO_2 is sometimes used to euthanize mammals which are captured in live traps and when relocation is not a feasible option. Live mammals are placed in a sealed chamber. CO_2 gas is released into the chamber and the animal quickly dies after inhaling the gas. This method is approved as a euthanizing agent by the AVMA. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere,
and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is 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.

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

Zinc Phosphide is a toxicant used to kill rodents, lagomorphs and nutria. In Maine, this pesticide will not be used on species that are protected, including T&E species. It is two to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Hill and Carpenter 1982, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, and Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume prairie dog tissue (Johnson and Fagerstone 1994).

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

In addition, zinc phosphide has a strong emetic action (*i.e.,* causes vomiting) and most nontarget animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract

and generally do not eat the stomach and intestines (Hegdal et al. 1980, Johnson and Fagerstone 1994). Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siefried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from zinc phosphide grain bait consumption or, for scavenging bird species, from eating poisoned rodents. Use of rolled oats instead of whole grain also appears to reduce bird acceptance of bait. Uresk et al. (1988) reported on the effects of zinc phosphide on 6 nontarget rodent populations. They determined that no differences were observed from pretreatment until after treatment in populations of Eastern cottontail rabbits (*Sylvilagus floridanus*) and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by nontarget wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (*Peromyscus maniculatus*) populations in areas treated with zinc phosphide, however the effect was not statistically significant because of high variability in densities and the reduction was not long-term (Deisch et al. 1990).

Ramey et al. (2000) reported that five weeks after treatment, no ring-necked pheasants (*Phasianus colchicus*) had been killed as a result of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect nontarget populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poison grain remaining for their consumption was low (*i.e.,* bait was accepted by prairie dogs before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide. Reduced impacts on birds have also been reported by Tietjen and Matschke (1982). Deisch et al. (1989) reported on the effect zinc phosphide has on invertebrates. They determined that zinc phosphide bait reduced ant densities, however, spider mites, crickets, wolf spiders, ground beetles, darkling beetles and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Desich 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect populations sampled (Deisch et al. 1989). Long-term effects were not directly related to rodenticides, but more to habitat changes (Deisch 1986) as vegetative cover and prey diversity increased without prairie dogs grazing and clipping the vegetation (Deisch et al. 1989).

Repellents are usually naturally occurring substances or chemicals formulated to be distasteful or to elicit pain or discomfort for target animals when they are smelled, tasted, or contacted. Only a few repellents are commercially available for mammals, and are registered for only a few species. Repellents are not available for many species which may present damage problems, such as some predators or furbearing species. Repellents are variably effective and depend to a great extent on resource to be protected, time and length of application, and sensitivity of the species causing damage. Again, acceptable levels of damage control are usually not realized unless repellents are used in conjunction with other techniques.

APPENDIX C
SPECIES THAT ARE FEDERALLY LISTED AS THREATENED OR ENDANGERED IN THE STATE OF MAINE

Status	***Animal species listed in this state and that occur in this state***
T	Lynx, Canada (*Lynx Canadensis*)
T	Bat, Northern long-eared (*Myotis septenrionalis)*
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Ridley, Atlantic (*Lepidochelys kempi*)
E	Salmon, Atlantic (*Salmo salar*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sea turtle, hawksbill (*Eretmochelys imbricate)*
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Sturgeon, Atlantic (*Acipenser oxyrinchus oxyrinchus)*
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, Humpback (*Megaptera novaeangilae*)
E	Whale, northern right (*Balaena glacialis (incl. australis)*)
E	Whale, Sei (*Balaenoptera borealis*)
E	Whale, blue (*Balaenoptera musculus)*
E	Whale, Sperm (*Physeter catodon*)
E	Bumble Bee, Rusty Patch (*Bombus offinis)*
E	Wolf, gray (*Canis lupus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
Status	***Plant species listed in this state and that occur in this state***
E	Lousewort, Furbish (*Pedicularis furbishiae*)
T	Pogonia, small whorled (*Isotria medeoloides*)
T	Orchid, Prairie white-fringed (*Platanthera leucophaea*)

APPENDIX D
SPECIES THAT ARE STATE LISTED AS THREATENED OR ENDANGERED IN THE STATE OF MAINE

<u>Maine's Endangered Species</u> Birds

- American Pipit (*Anthus rubescens*) (breeding population only)
- Black-crowned Night Heron (*Nycticorax nycticorax*)
- Black Tern (*Chlidonias niger*)
- Golden Eagle (*Aquila chrysaetos*)
- Grasshopper Sparrow (*Ammodramus savannarum*)
- Least Bittern (*Ixobrychus exilis*)
- Least Tern (*Sterna antillarum*)
- Peregrine Falcon (*Falco peregrinus*) (breeding population only)
- Piping Plover (*Charadrius melodus*) **
- Roseate Tern (*Sterna dougallii*)*
- Sedge Wren (*Cistothorus platensis*) **Fish**

- Redfin Pickerel (*Esox americanus americanus*)

Invertebrates Beetles

- Cobblestone Tiger Beetle *(Cicindela marginipennis)* **Butterflies and Skippers**

- Edwards' Hairstreak (*Satyrium edwardsii*)
- Frigga Fritillary *(Boloria frigga)*
- Hessel's Hairstreak (*Callophrys hesseli*)
- Juniper Hairstreak (*Callophrys gryneus*)
- Katahdin Arctic (*Oenis polixenes katahdin*)

Dragonflies and Damselflies

- Rapids Clubtail (*Gomphus quadricolor*)

Snails

- Six-whorl Vertigo (Vertigo morsei)

Mammals

- Little Brown Bat *(Myotis lucifugus)*
- New England Cottontail (*Sylvilagus transitionalis*)
- Northern Long-eared Bat *(Myotis septentrionalis)***

Reptiles

Snakes

- Black Racer (*Coluber constrictor*) **Turtles**

- Blanding's Turtle (*Emydoidea blandingii*)
- Box Turtle (*Terrapene carolina*)

<u>Maine's Threatened Species</u> Birds

- Arctic Tern (*Sterna paradisaea*)
- Atlantic Puffin (PDF) (*Fratercula arctica*)
- Barrow's Goldeneye (*Bucephala islandica*)
- Common Gallinule (*Gallinula chloropus*)
- Great Cormorant (*Phalacrocorax carbo*) (Breeding population only)
- Harlequin Duck (*Histrionicus histrionicus*)
- Razorbill (*Alca torda*)
- Short-eared Owl (*Asio flammeus*) (Breeding population only)
- Upland Sandpiper (*Bartramia longicauda*)

Fish

- Swamp Darter (*Etheostoma fusiforme*)

Invertebrates

Butterflies and Skippers

- Clayton's Copper (*Lycaena dorcas claytoni*)
- Purple Lesser Fritillary (*Boloria chariclea grandis*)
- Sleepy Duskywing (*Erynnis brizo*)

Dragonflies and Damselflies

- Boreal Snaketail (*Ophiogomphus colubrinus*)
- Ringed Boghaunter (*Williamsonia lintneri*)

Freshwater Mussels

- Brook Floater (*Alasmidonta varicosa*)
- Tidewater Mucket (*Leptodea ochracea*)
- Yellow Lampmussel (*Lampsilis cariosa*)

Mayflies

- Roaring Brook Mayfly (*Epeorus frisoni*)
- Tomah Mayfly *(Siphlonisca aerodromia)*

Moths

- Pine Barrens Zanclognatha (*Zanclognatha martha*)
- Twilight Moth (PDF) (*Lycia rachelae*)

Mammals

- Eastern Small-footed Bat *(Myotis leibii)*
- Northern Bog Lemming (*Synaptomys borealis*)

Reptiles

- Spotted Turtle (*Clemmys guttata*)

**** Federally listed as Endangered***
***** Federally listed as Threatened***

APPENDIX E. Section 7 Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services Maine Field
Office 306 Hatchery Road
East Orland, Maine 04431 Telephone:
207/469-7300 Fax: 207/902-1588

April 27, 2018

Robin Dyer
State Director

USDA, APHIS, Wildlife Services
79 Leighton Road, Suite 12
Augusta, Maine 04330

Dear Ms. Dyer:

This document transmits the U.S. Fish and Wildlife Service's (Service) programmatic biological opinion (PBO) based on our review of the referenced project and its effects on the federally listed threatened Canada lynx *(Lynx canadensis)* and the federally listed endangered Atlantic salmon *(Salmo salar)* and their respective designated critical habitat in accordance with section 7 of the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA). Your request for formal consultation was received in August 22, 2018.

This Opinion is based on information provided in the biological assessment, telephone conversations, field investigations, and other sources of information. The consultation history is located after the Literature Cited. A complete administrative record of this consultation is on file in this office.

The Service determined the proposed action will have no effect on designated critical habitat for Canada lynx because proposed activities will not impact any primary constituent elements of critical habitat.

The Service also determined the proposed actions are not likely to adversely affect the federally listed endangered Atlantic salmon *(Salmo salar)* or its designated critical habitat. To date, the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) in Maine has not caused take to individual Atlantic salmon through application of any methods utilized for mammal damage management (MDM). The majority of MDM conducted by the WS does not occur in suitable Atlantic salmon habitat. The MDM activities associated with the beaver damage management program and activities to alleviate damage caused by other

semiaquatic mammals such as mink, muskrats, and river otters would be the only MDM methods that could have the potential to affect Atlantic salmon. Avoidance of Atlantic salmon during the MDM activities will be achieved by determining if the area where the MDM activities will occur contained existing Atlantic salmon populations, or if the time of year precluded Atlantic salmon presence. In areas of known existing Atlantic salmon populations, the WS will incorporate all regulation and recommendations established by state wildlife agencies and the Service as well as

standard operating procedures (SOPs) established by the WS to avoid incidental take of Atlantic salmon. When the MDM includes trapping, the WS will also follow best management practices (BMPs) developed by the Association of Fish and Wildlife Agencies (AFWA) for trapping devices (AFWA 2006).

Proposed activities affecting key components of critical habitat, such as removal of beaver dams, will be temporary and result in only insignificant effects. Though the intensity and duration of the effects associated with turbidity and sedimentation result in measured changes of habitat preference by Atlantic salmon and sublethal effects to juvenile Atlantic salmon, but they do not have residual effects on the habitat function. Turbidity releases will be temporary and within the natural seasonal fluctuations in streams, and are not expected to affect Atlantic salmon redds and spawning areas, or reduce the quality of rearing habitat.

All trapping activities are considered to have discountable probability of causing adverse effects to Atlantic salmon and its designated critical habitat is predicated on the form and nature of the device in addition to the implementation of the following conservation measures as part of the proposed activities:

- Prior to the removal of a beaver dam; or the use of bodygrip traps, cable devices, suitcase traps, or water flow devices in the Atlantic salmon distinct population segment (DPS) area, the WS will consult with the Service and the appropriate state agencies to determine occupancy and presence of suitable spawning habitat or redds and to discuss how the WS should proceed.
- Water flow devices and beaver exclusion systems that would limit the ability of Atlantic salmon to migrate upstream or downstream past the device (e.g. perforated pipes with end caps) will not be installed in occupied salmon waters.
- The WS will avoid the use of suitcase traps in the Atlantic salmon DPS.
    - If suitcase traps are used, the WS personnel will use best judgment in trap placement to minimize the potential of incidentally capturing an Atlantic salmon.
    - The WS will not place suitcase traps perpendicular to stream flow or channel within a narrow (six feet or less) stream channel located within occupied Atlantic salmon habitat.
- The WS will make every attempt to avoid using bodygrip traps in the Atlantic salmon DPS. Bodygrip traps will be used when and where a need exists and only if other capture devices are deemed ineffective or impractical for situational use.
    - When setting bodygrip traps in water bodies occupied by Atlantic salmon, bodygrip triggers will be adjusted to minimize the chance of incidentally capturing an Atlantic salmon (AFWA 2016, Polechla and Walker 2008). Specific adjustments will include positioning the trigger mechanism within two inches of the side of the trap with one of the trigger wires bent perpendicular to the other wire (AFWA 2016, Polechla and Walker 2008).
    - If bodygrip traps are used, the WS personnel will use best judgment in trap placement to minimize the potential of incidentally capturing an Atlantic salmon.

- The WS will make every attempt to avoid using cable devices in the Atlantic salmon DPS. They will be used when and where a need exists and only if other capture devices are deemed ineffective or impractical for situational use.
    - In occupied Atlantic salmon habitat, loop sizes required to capture beaver will be set at least nine inches in diameter to allow Atlantic salmon to pass through without harm.
    - Cable devices will not be used for other semiaquatic species (river otter, mink, or muskrat) in occupied Atlantic salmon habitat.
    - If cable devices are used, the WS personnel will use best judgment in trap placement to minimize the potential of incidentally capturing an Atlantic salmon.
- The WS must conduct beaver dam removal between June 15 and September 30.
    - If beaver dam removal cannot be completed between June 15 and September 30, prior to removal, the WS must contact the Service to confirm the presence or absence of redds or suitable spawning habitat within 1,000 feet downstream of a proposed beaver dam removal site.
    - If redds or suitable spawning habitat is confirmed by the Service within 1,000 feet downstream of a proposed beaver dam removal site and removal cannot be completed between June 15 and September 30, the WS must install a turbidity curtain immediately downstream of the removal location prior to and during removal.
    - The WS will remove beaver dams by hand at the request of the cooperator, and when property damage is verified by the WS.
    - The WS will not use or recommend the use of heavy equipment such as backhoes and bulldozers for dam breaching or removal.
- The WS will immediately report any incidental take of Atlantic salmon to the Service in the event one were captured, injured, or killed through application of any method utilized by the WS for MDM.
- Activities associated with aquatic MDM will be included in the annual report.

TABLE OF CONTENTS

1.0 PROGRAMMATIC BIOLOGICAL OPINION

1.1 Programmatic Consultation Process

This programmatic consultation addresses the actions of the lead agency; the WS in the states of Maine, New Hampshire, and Vermont; and creates a streamlined and transparent process with efficiencies realized by the WS and the Service. The WS will utilize SOPs and BMPs that will incorporate a set of Avoidance and Minimization Measures (AMMs).

An annual summary of activities and potential adverse effects or take of Canada lynx will be provided to the Service. The effective period of this programmatic biological opinion (PBO) is five years and it will be renewed upon mutual agreement from the WS and the Service. This renewal will be facilitated through the issuance of a letter by the Service and will not require the creation of a new biological opinion, unless reinitiation is deemed necessary (standard consultation reinitiation conditions [50 CFR 402.16, e.g., new information on species or effects] apply).

1.2 Adaptive Management

The WS and the Service will apply adaptive management strategies throughout the effective lifetime of this consultation. Incorporating new information on the effects of the action and the function of the program will allow the WS and the Service to ensure that effects of the proposed actions are effectively minimized and that the programmatic is consistent with stated efficiency and conservation goals. Changes to this consultation will be considered on an annual basis, but they may also occur at any time that the WS and the Service agree it is appropriate. During annual reviews, the WS and the Service will discuss existing protocols, AMMs, and other commitments and assumptions made herein to ensure this programmatic consultation is being implemented successfully and appropriately.

The WS will generate an annual report for submittal to the Service, in addition to conducting an annual program review with the Service. This report will summarize program activities and any Take for the reporting year (for the sake of this PBO, “year” refers to the calendar year, January 1 to December 31), information that may inform potential effect assumptions, and implementation of conservation measures. The annual review may be facilitated by a meeting which will serve as the regular forum for all parties to discuss program changes and the need for reinitiation of consultation.

2.0 DESCRIPTION OF THE PROPOSED ACTION

As defined in the ESA Section 7 regulations (50 CFR 402.02), “action” means “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas.” The “action area” is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.” The following is a summary of the proposed action and a detailed description can be found in the BA provided by the WS as part of this consultation.

2.1 Mammal Damage, Oral Rabies Vaccination, and National Rabies Management Programs

The Maine, New Hampshire, and Vermont WS programs include the MDM, the oral rabies vaccination (ORV) program, and the National Rabies Management Program (NRMP) activities. The current programs use an Integrated Mammal Damage Management (IMDM) approach to apply practical and effective MDM methods sequentially or in combination for the prevention and reduction of damage and conflicts caused by mammals, based on local problem analyses and the informed decisions of trained WS personnel.

The WS provides services (technical assistance or direct operational) to protect livestock, property, human health and safety, and natural resources from damage caused by a wide range of mammal species. Requests for assistance may be handled by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by mammals, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. The exception to this is bats, which the WS does not work with. Requests for assistance with bats received by the WS are sent to the respective state wildlife agency.

Technical assistance is information, demonstrations, and advice on available and appropriate MDM methods. The implementation of damage management actions is the responsibility of the requester. In some cases, the WS can provide supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Technical assistance may include providing advice, information, instructional sessions, demonstrations, recommendations, equipment loans, and information on the availability and use of non-lethal and lethal methods for others to use in resolving mammal damage problems. Non-lethal methods recommended by the WS could include, but would not be limited to, localized habitat modification, cultural practices, pyrotechnics, harassment, animal husbandry practices, installation of electric fences, referring mammal damage situations out to private nuisance wildlife control operators, live-trapping and translocation, and guard animals. Lethal methods recommended by the WS could include, but would not be limited to, shooting, trapping and euthanizing, and recreational hunting and trapping.

Direct operational damage management assistance includes damage management methods that are directly conducted or supervised by WS personnel. The WS direct operational mammal damage management efforts utilize site-specific non-lethal and lethal management measures and could include nonchemical methods such as shooting, aerial shooting, animal capture devices, hazing, beaver dam removal, exclusions, habitat modification, water flow devices, translocation, and cervical dislocation, and chemical methods, including repellents, immobilizing and reversal agents, medicinal drugs, euthanizing agents, and registered pesticides.

The IMDM approach would encompass the use of the most practical and effective methods to resolve a problem, and methods would be selected based on the efficiency to reduce damage or threats to human safety for each request. Preference would be given to non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal

methods, or could include instances where application of lethal methods alone would be the most appropriate strategy. In many situations, the implementation of non-lethal methods would be the responsibility of the requester which means that, in those situations, the only function of the WS would be to implement lethal methods if determined to be necessary. The MDM by the WS would be conducted when requested on private property or public facilities where a need has been documented upon the completion of a cooperative service agreement. All management actions would comply with appropriate Federal, state, and local laws.

The WS MDM efforts are not intended to reduce overall native mammal populations in the state or region although in some instances, reduction of local population densities may be conducted to address site specific damage problems. However, projects to address problems with non- native species, such as feral swine and exotics, may be intended to reduce or eliminate the local, regional (within a state), or state populations.

The MDM activities may be conducted on additional species as requested, but MDM activities will only utilize the methods described in this document unless the method would have no effect on a threatened and endangered species. If new or additional methods are utilized that are not covered in this PBO and have the possibility of affecting a threatened and endangered species, a separate section 7 consultation will occur prior to that action. During the annual review, if the WS believes they will continue utilizing any methods not covered by this PBO that may have affects to any listed species; the WS and the Service may reinitiate to add this action to the PBO.

2.2 Canada Lynx Response Team

The WS may respond to emergency calls as part of a state Canada lynx response team, for example in the case of incidental Canada lynx captures; injured Canada lynx; or individuals that are trapped in enclosures, buildings, or structures. Prior to assisting any state's Canada lynx response team, the WS will undergo training in Canada lynx chemical immobilization and handling and care in order to release, translocate, seek veterinarian care, or attach tags/transmitters to them safely. When responding as part of a Canada lynx response team, WS staff would follow state specific Canada lynx response protocols.

To date, the Maine WS has not been asked to participate in the Canada lynx response team but would be available to assist if a situation occurs. The WS in Maine foresees assistance with the Maine Department of Inland Fish and Wildlife (MDIFW) Response Team to continue over the next three to five years. The WS has been asked to participate on Canada lynx response teams in Vermont and New Hampshire. To date, the WS has not responded to a trapped Canada lynx in either Vermont or New Hampshire. The WS anticipates this will not occur often, but the WS would be available to assist if a situation occurs. WS in Vermont and New Hampshire foresees assistance with the Vermont Fish and Wildlife Department and New Hampshire Fish and Game Response Team to continue over the next three to five years.

2.3 Canada Lynx Translocation

It is possible under certain circumstances for the WS to be called upon to assist with the translocation of Canada lynx by a state wildlife agency or a private entity as part of a Canada lynx response team, if a Canada lynx is discovered in sensitive areas (e.g., military, business, or

airport facilities), trapped in buildings or structures, or if a Canada lynx is causing damage or a threat of damage to human health and safety, agricultural resources, property, or natural resources. Translocation of wildlife is discouraged by the WS policy (WS Directive 2.501) because of stress to the translocated animal, poor survival rates, difficulties in adapting to new locations or habitats, and potential to spread disease and damage concerns at the new location. However, there are exceptions for the translocation of damaging mammals that might be a viable solution, such as when the mammals are considered to have high value such as threatened and endangered species. If the WS needed to translocate a Canada lynx, it would only be done at the direction of, and only after consulting with the Service and/or the appropriate state agency.

2.4 Activity Summary

Descriptions of specific MDM program activities conducted by the Maine WS program, the Vermont WS program, the New Hampshire WS program, and the NRMP are summarized in Table 1. A detailed description of each activity can be found in the BA provided by the WS as part of this consultation.

Table 1. Summary of program activities conducted by WS in Maine, Vermont, and New Hampshire and as part of the NRMP.

Activity	State	Primary Target Species	Main Methods Utilized[1]	Frequency Activity Conducted[2]	3 to 5 Year Projection
Technical Assistance	ME	All mammals	Provide TA	D	No change
	VT				Increase
	NH				No change
MDM at Airports	ME	All mammals	DB, CR, CT, BL, CP, CU, FH, CFR, HN, CID, Tran, BG, SH, WB/ST, ZP, GC, WS	D	No change
	VT	Coyotes, white-tailed deer, foxes (red and gray), bats, beaver, rabbits, skunks, woodchuck, bobcat, raccoon, feral cats and dogs, & opossums	DB, BG, CT, CR, SH, GC, WB/ST, CL, CP, CU, FD, HN, RFH	D	No change
	NH			D	Increase
Human Health and Safety	ME	All mammals	FD, DB, CR, CT, CL, BL, CP, CU, FH, RFH, CFR, HN, CID, Tran, SH, WB/ST, CD, ZP, GC WS	D	No change
	VT	Woodchuck, raccoon, striped skunk, feral swine, opossum, porcupine, moose,	SH, GC, BG, CT, CU, WB/ST, FH, ZP, CL, CO, DB, HN, RFH	D	Increase

Table 1. Summary of program activities conducted by WS in Maine, Vermont, and New Hampshire and as part of the NRMP.

Activity	State	Primary Target Species	Main Methods Utilized[1]	Frequency Activity Conducted[2]	3 to 5 Year Projection
	NH	coyote, muskrat, beaver, black bear, feral cat, fox (red and gray), white-tailed deer		D	Increase
Disease Surveillance	ME	Exotic cervids	SH, CID, CT, BG	M	No change
	VT	Raccoon, striped skunk, fisher, fox (red & gray), white-tailed deer, coyote, cottontail rabbits, opossum, snowshoe hare, E gray squirrel, red squirrel, bobcat, E chipmunk, mice-all, bats-all, black bear, feral goat, swine, & sheep	CP, RFH, HN, CID, BG, SH, WB/ST, CT, GC, CR, CFR, FH, CL, CO, CU	M	Increase in NH & VT
	NH			M	
Rabies Management (NRMP)	ME	Raccoons, skunks, beaver, woodchucks, bats, feral cats & dogs, fox (red & gray), coyote	CT, CID	D	No change
	VT		CT, FH, CP, RFH, CID,SH, WS, CR, BG, HN	D/S	No change
	NH			D/S	No change
Bear Management	ME	Black bears	CT, CP, CU, CFR, CID, Tran, SH, WS	Q	No change
	NH		CU, CT, HN, CID, Tran, CFR, SH	D/S	No change
	VT				Increase
Cervid Management	ME	White-tailed deer, moose, exotic cervids	SH, CID, CL, WS	Q	No change
	VT		CID,SH, Tran, CL	A	No change
	NH				
Feral Swine Management	ME	Feral swine	SH, CO, CID, CR	Q	No change
	VT		SH, CO, CID,CR	D/S	Decrease
	NH			D/S	No change
Aquatic Rodent Management	ME	Beavers, muskrats	SH, BG, FH, ST, FD, DB, BL	D/S	No change
	VT	Beavers, muskrats	FD, DB, CR, BL, FH, BG, SH	D/S	Increase
	NH			Q	Increase

Table 1. Summary of program activities conducted by WS in Maine, Vermont, and New Hampshire and as part of the NRMP.

Activity	State	Primary Target Species	Main Methods Utilized[1]	Frequency Activity Conducted[2]	3 to 5 Year Projection
Terrestrial Rodent Management	ME	Woodchuck, mink, chipmunk, porcupine, gray squirrel, red squirrel, vole, mole, rat, deer mouse, house mouse, shrew	ST, CT, ZP, GC, WS	S	No change
	VT	Woodchuck	SH, GC, BG, FH, CP, CT, CR,	D/S	No change
	NH			D/S	Increase statewide
MDM at Landfills	ME	All mammals	WS	M	No change
	VT	Raccoons, skunks, woodchucks, fox (red & gray), black bear, opossum, rats, moose, black bear, coyote	DB, BG, CT, CR, SH, GC, WB/ST, CL, CP, CU, FD, HN, RFH	D	No change
	NH			D	No change
Livestock Protection	ME	None	None	None	No change
	NH	Coyotes, gray fox, red fox, black bear, feral swine	FH, CU, SH, CR, CO, GC	S	Increase statewide
	VT			D/S	
Natural Resource Protection	ME	All mammals	FD, DB, CR, CT, CL, BL, CP, FH, CFR, HN, CID, Tran, BG, SH, WB/ST, ZP, GC, WS	D	No change
	VT	Raccoon, striped skunk, feral cat, woodchuck, red fox, opossum	SH, CT, CR, BG, FH, RFH, CO, DB, FD, GC	D/S	No change
	NH				

Table 1. Summary of program activities conducted by WS in Maine, Vermont, and New Hampshire and as part of the NRMP.

Activity	State	Primary Target Species	Main Methods Utilized[1]	Frequency Activity Conducted[2]	3 to 5 Year Projection
Threatened and Endangered Species Protection	ME	Red fox, gray fox, coyote, raccoon, striped skunk, opossum, short-tailed weasel, long-tailed weasel, mink, feral cats, feral/free ranging dogs, eastern chipmunks	CR, CT, CP, FH, BG, SH, WB/ST, GC,	S	No change
	VT	Raccoon, striped skunk, feral cat, woodchuck, red fox, opossum	SH, CT, CR, BG, FH, RFH, CO, DB, FD, GC	S	Increase
	NH			S	Increase
Canada Lynx Response Team and Translocations	ME	Canada lynx	CT, CP, FH, CID, Tran, WS	A	No change
	VT		CID, Tran	A	NH joining LRT
	NH				

[1] Method abbreviations are as follows: FD=water flow devices, DB=beaver dam breaching/removal, CR=cable restraints, CT=cage traps, CL=clover traps, BL=beaver live traps, CP=catch pole, CU=culvert traps, FH=foothold traps, RFH=specialized raccoon foothold traps, CFR=cable foot restraints, HN=hand nets, CID=chemical immobilization and accessory drugs (ketamine, xylazine, Tiletamine, yohimbine, tolazoline, atropine, doxapram, and/or antibiotics), Tran=translocation, BG=bodygrip traps, SH=shooting, AS=aerial shooting, WB/ST=weasel boxes/snap traps, CD=cable devices, ZP=zinc phosphide, GC=gas cartridges, and WS=wildlife surveys. This list contains the most common methods employed for each activity. In certain circumstances, additional methods may be employed.

[2] Frequency abbreviations and definitions are as follows: D=daily (multiple times/week), M=monthly (several months/year), Q=quarterly (once/quarter), A=annually (once/year), S=seasonally (less than two seasons/year), and D/S=daily/seasonally (daily for greater than six months/year).

2.5 Methods

The WS uses a wide variety of methods to conduct MDM and the NRMP activities listed in Section 2.1 that have potential to affect Canada lynx. A detailed description of each method can be found in the BA provided by the WS as part of this consultation. All methods will be used in accordance with the WS program policies and use of methods by will comply with all applicable Federal, state, and local laws and regulations. The WS directives describe specific training requirements for employees before they may utilize particular methods. Table 2 is a summary of the extent that WS has employed each method.

Table 2. Summary of methods employed to carry out program activities conducted by WS in Maine, Vermont, and New Hampshire.

Method	State	Average Annual Trap Nights or Use[1]	Utilization Notes
Non-lethal			
Translocation	ME, VT, NH	--	Has not been utilized

Table 2. Summary of methods employed to carry out program activities conducted by WS in Maine, Vermont, and New Hampshire.

Method	State	Average Annual Trap Nights or Use[1]	Utilization Notes
Cable restraints	ME	--	Not currently legal
	VT	127	
	NH	--	Not currently utilized
Cage traps	ME	1,731	The most frequently utilized trap type, checked daily
	VT	15,861	
	NH	1,477	
Clover/corral traps	ME	--	Neither clover or corral traps are currently utilized
	VT	--	
	NH	255	Annual average only reflects corral traps, clover traps are currently utilized
Catch poles	ME, VT, NH	--	Catch poles are utilized in all three states to control non-target mammals incidentally caught in traps before release
Culvert traps	ME	--	Not currently utilized
	VT	--	
	NH	172	Typically utilized near campgrounds, resort areas, and suburban neighborhoods
Foothold traps (including specialized raccoon traps)	ME	306	All foothold trap use complies with BMP standards for the target species
	VT	169	
	NH	80	
Cable foot restraint	ME	8	Used by ME and VT WS in situations that preclude the use of culvert traps to capture black bears
	VT	42	
	NH	--	Not currently utilized
Suitcase traps	ME	1,861	Routine use of Hancock style suitcase traps
	VT	--	Not currently utilized
	NH	<1	There has been only one instance of the utilization of a suitcase trap over the last five years in NH

Table 2. Summary of methods employed to carry out program activities conducted by WS in Maine, Vermont, and New Hampshire.

Method	State	Average Annual Trap Nights or Use[1]	Utilization Notes
Hand nets	ME, VT, NH	--	Hand nets are used in urban situations to assist with capturing individual small to medium-size mammals trapped in a building, residence, or outdoors and used for handling captured animals caught within these areas
Lethal			
Bodygrip traps	ME	391	The wide variety of trap types utilized are summarized in the BA provided by the WS as part of this consultation
	VT	743	
	NH	332	
Shooting	ME	498	100 percent selective
	VT	128	
	NH	124	
Aerial shooting	ME, VT, NH	--	100 percent selective, though not currently utilized
Weasel boxes/snap traps	ME	1,316	Small box trap used on small mammals
	VT	82	
	NH	240	
Cable devices	ME	--	Not currently legal
	VT	257	
	NH	--	Not currently utilized
Lethal Chemicals			
Zinc phosphide	ME, VT, NH	--	Not currently utilized
Gas cartridges	ME	65	Highly targeted
	VT	52	
	NH	244	

Table 2. Summary of methods employed to carry out program activities conducted by WS in Maine, Vermont, and New Hampshire.

Method	State	Average Annual Trap Nights or Use[1]	Utilization Notes
Non-lethal Chemicals			
Ketamine, Xylazine	ME	141	Highly targeted use to immobilize mammals
	VT	669	
	NH	31	
Tiletamine, Yohimbine, Tolazoline, Atropine, Doxapram, antibiotics	ME, VT, NH	--	Not currently utilized

[1] Traps list trap nights while chemicals list the number of times administered

2.6 Conservation Measures

The following conservation measures are proposed as part of the action and are measures that will help avoid, minimize, and mitigate effects of the proposed action on Canada lynx. These AMMs are numbered consecutively to make it easier to reference them later in this document.

2.6.1 Translocation

1. Translocation of Canada lynx would be considered a choice of last resort, and will only carried out if the WS sees no alternative.
2. The WS will consult with the Service and the appropriate state agency to get authorization and to determine the best method to carry out translocation.
3. The WS will follow state specific protocols for trapping, handling, and releasing of Canada lynx.
4. The WS employees will be trained in Canada lynx trapping, handling, and translocation; in order to trap, release, translocate, seek veterinarian care, or attach tags/transmitters to Canada lynx.

2.6.2 Cable Restraints

The Vermont and New Hampshire WS have developed the following SOPs to minimize this potential while operating within the Canada lynx protection zone, which will also be implemented if cable restraints are utilized within the Canada lynx review area (the geographic area where the Services requires consultation for actions that may affect Canada lynx) in Maine:

5. Cable restraints will not be set in the vicinity of Canada lynx tracks and the WS will remove cable restraints if Canada lynx tracks are observed in the vicinity of cable restraints during MDM activities.

6. Cable restraints will be checked daily. During extreme environmental conditions, traps could be checked more frequently or traps will not be set.
7. Cable loops for coyotes and foxes will measure at least eight inches wide since this detail would aid a Canada lynx to avoid or remove the cable restraint before it closes.
8. Cable restraints will not be set within 30 feet of bait. Bait is defined as: animal matter, including meat, skin, bones, feather, hair, or other solid substance that used to be part of an animal. This includes live and dead fish. For purposes of this paragraph, bait does not include animal dropping (scat), urine, or animals, dead or alive, held in a trap as the result of otherwise lawful trapping activities.

The WS will follow the current cable restraint regulations proposed by the MDIFW in the Incidental Take Plan for Maine's Trapping Program until these regulations are amended:

9. Cable restraints will include cable with a diameter of 1/8 or 3/32 inches, a relaxing mechanical lock of a reverse-bend washer with a minimum diameter of 1 1/4 inches, and at least one swivel on the cable restraint.
10. Cable restraints will include a breakaway device with a resistance set at 350 pounds.
11. Cable restraints will include two stops:
    a) One to restrict the loop size to no larger than a 12 inch loop.
    b) One to restrict the loop size to 2.5 inches when fully closed.
12. Cable restraints will be securely anchored to the ground and all surrounding vegetation (including woody vegetation 0.5 inches or larger in diameter) which the restrained animal can become entangled in will be removed.
13. The WS employees will be trained in the proper use and setting of cable restraints before setting cable restraints in the field.

2.6.3 Cage Traps

14. The WS will check cage traps at least once daily.
15. Good judgment in trap placement will be used to avoid added exposure to environmental conditions such as direct sunlight.
16. The WS will avoid the use of fresh meat of any species (especially rabbit or hare) or lure designed to attract Canada lynx when setting cage traps in identified Canada lynx areas.
17. If a need arises for the WS to perform cage-trapping activities in occupied Canada lynx range, the WS will consult with state wildlife officials to identify areas of Canada lynx use and to evaluate the options to avoid Canada lynx capture.

2.6.4 Clover Traps/Corral Traps

18. Traps set in Canada lynx protection zones or within the Canada review area will be equipped with an escape route.
19. The WS will check clover traps on a daily basis.

20. The WS will use best judgment in trap placement to avoid added exposure to environmental conditions such as direct sunlight. During extreme environmental conditions, traps will be checked more frequently or traps will not be set.
21. The WS will not set a clover trap in the vicinity of Canada lynx tracks, and if possible, will set clover traps in habitat that is generally avoided by Canada lynx (urban, suburban, and/or agricultural environments, and hardwood habitat that deer require). If fresh Canada lynx tracks were observed in the vicinity of a clover trap, the WS will remove the trap from the area.

2.6.5 Catch Poles

22. The WS will be trained and follow their individual state plans on the proper use of a catch pole.

2.6.6 Suitcase Traps

23. The WS will place all beaver live traps with the bottom portion in the water and with the opening of the trap facing away from land.
24. Whereas it is understood that Canada lynx are attracted to beaver castor, beaver live traps must be placed in a position that will allow Canada lynx to approach the back of the trap to reach the lure without passing through the open side of the trap. Open access to the rear portion of the traps will be maintained free of heavy vegetation or large obstacles.

2.6.7 Culvert Traps

25. When utilizing these traps in known Canada lynx habitat, the WS will not use any olfactory attractant containing cat lure, fish oil, or fresh meat (especially rabbit or hare). In most cases, sweet baits, (e.g., cakes, pastries) should be utilized to attract bear and not Canada lynx. In Maine, the WS will not set culvert traps within 50 yards of visual attractants, such as brightly colored objects.
26. Culvert traps will be checked at least on a daily basis.
27. Best judgment in trap placement will be used to avoid added exposure to environmental conditions such as direct sunlight. During extreme environmental conditions, traps will be checked more frequently or traps will not be set.
28. If possible, the WS will set culvert traps in habitat that is generally avoided by Canada lynx. If fresh Canada lynx tracks are observed in the vicinity of a culvert trap, the WS will remove the culvert trap from the area.

2.6.8 Foothold Traps (including Specialized Raccoon Foot Traps)

29. The WS will not set foothold traps in the vicinity of Canada lynx tracks or other sign, and if possible, will set foothold traps in habitat that is generally avoided by Canada lynx. The WS will also remove foothold traps if Canada lynx tracks or other sign are observed in the vicinity of the foothold traps during MDM activities.
30. Foothold traps will be checked daily.

31. The WS personnel will use best judgment in trap placement to minimize non-target species and to avoid added exposure to environmental conditions such as direct sunlight. During extreme environmental conditions, traps will be checked more frequently or traps will not be set.
32. Foothold traps will not be set within 50 yards of bait visible from above. Flagging will not be used in conjunction with trap sets in identified Canada lynx areas.
33. The WS will not use snowshoe hares, other fresh meat, or cat lure as bait.
34. The WS will follow the most up-to-date state specific trapping regulations and standards, within potentially occupied Canada lynx habitat, developed to minimize the potential of capturing a Canada lynx in a foothold trap.
35. All foothold traps used by the WS will comply with BMP standards for the target species listed in WS Directive 2.450. The WS will only set BMP foothold traps in Canada lynx areas with an inside jaw spread of less than five and three-eighths inches and that have padded, offset, cast, or laminated jaws.

2.6.9 Cable Foot Restraints

36. The WS will not set cable foot restraints in the vicinity of Canada lynx tracks, and if possible, will set cable foot restraints in habitat that is generally avoided by Canada lynx. The WS will also remove cable foot restraints if Canada lynx tracks are observed in the vicinity of the cable foot restraints during MDM activities.
37. Cable foot restraints will be checked daily.
38. The WS personnel will use best judgment in trap placement to minimize capture of non-targets and to avoid added exposure to environmental conditions such as direct sunlight. During extreme environmental conditions, traps will be checked more frequently or traps will not be set.

2.6.10 Weasel Boxes (Snap Traps)

39. The WS will not set a snap trap in the vicinity of Canada lynx tracks, and if possible, will set snap traps in habitat that is generally avoided by Canada lynx. If fresh Canada lynx tracks were observed in the vicinity of a snap trap, the WS will remove the trap from the area.
40. The WS will utilize so-called weasel boxes, insofar as practical, to restrict access of Canada lynx to snap traps. In situations where snap traps must be set outside of weasel boxes, snap traps could be anchored in such a way that will allow a Canada lynx to pull its foot out of the trap.

2.6.11 Bodygrip Traps

41. The WS will not set bodygrip traps in the vicinity of Canada lynx tracks, and if possible, will set bodygrip traps in habitat that is generally avoided by Canada lynx. The WS will also remove bodygrip traps if Canada lynx tracks are observed in the vicinity of the trap during MDM activities.

42. The WS will follow the most up-to-date state specific trapping regulations and standards, within potentially occupied Canada lynx habitat, developed to minimize the potential of capturing a Canada lynx in a bodygrip trap.

2.6.12 Cable Devices (Lethal)

The Vermont and new Hampshire WS have developed the following SOPs:

43. In Vermont, this includes Caledonia, Orleans, and Essex counties and in New Hampshire this includes the Lynx Protection Zone.
44. The WS will not set cable devices in the vicinity of Canada lynx tracks and the WS will remove cable devices if Canada lynx tracks were observed in the vicinity of a cable device during MDM activities.
45. Cable devices set for beavers will be placed so that the cable loops will be at least one-half submerged in water when set, placed, and tended and away from areas easily accessible by Canada lynx.
46. Within Caledonia, Orleans, and Essex counties in Vermont and the Lynx Protection Zone in New Hampshire, cable loops for coyotes and foxes will measure at least eight inches wide since this detail would aid a Canada lynx to avoid or remove the device before it closes (Golden and Krause 2003).
47. Cable devices will not be set within 30 feet of exposed carcasses, according to WS Directive 2.450. Flagging will not be used in conjunction with trap sets in identified Canada lynx habitat.

Since cable devices are only approved for use by the WS in Maine for beaver as underwater sets, the Maine WS has developed the following SOPs:

48. The WS will not set cable devices in the vicinity of Canada lynx tracks and the WS will remove cable devices if Canada lynx tracks were observed in the vicinity of a cable device during MDM activities.
49. Cable devices will be set for beavers so that the cable loops are completely submerged in water when set, placed, and tended.

2.6.13 Zinc Phosphide

50. The Maine WS will not use zinc phosphide in the Canada lynx review area in Maine.
51. The WS will not use zinc phosphide in the Canada lynx protection zone in New Hampshire or in Caledonia, Orleans, or Essex counties in Vermont.

2.6.14 Gas cartridges

52. The WS will check dens and burrows for sign and presence of Canada lynx before application. If there are any signs (i.e., tracks, fresh scat, etc.) that a Canada lynx has been in the area or if a Canada lynx is observed in the vicinity of the den or burrow, the WS will not use gas cartridges in the den or burrow.

53. The WS will use gas cartridges in accordance to label directions.
54. The WS will be trained in the proper use of gas cartridges before applying this method.

2.6.15 Non-Lethal Chemicals

55. The WS administering immobilizing drugs will be trained and certified. The WS will follow approved procedures outlined in the WS Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001) and Directive 2.430.
56. In the event an individual Canada lynx experiences an adverse reaction to the drug administered, a veterinarian, the Service, a trained state wildlife biologist, and/or a trained WS employee would be consulted on the appropriate actions to take.
57. Any use of non-lethal drugs on Canada lynx will only occur through a previously agreed upon protocol approved by the Service, appropriate state wildlife agencies and/or state wildlife response team.

2.6.16 Shooting

58. The WS will make every attempt to remove carcasses and spent ammunition from the environment while carrying out this action.

3.0 ACTION AREA

The action area for this programmatic biological opinion consists of the entire states of Maine, New Hampshire, and Vermont. MDM could be conducted on private, Federal, state, county, and municipal lands or any other areas in these states upon request.

4.0 STATUS OF THE SPECIES AND CRITICAL HABITAT

Per the ESA Section 7 regulations (50 CFR 402.14(g)(2)), it is the Service's responsibility to "evaluate the current status of the listed species or critical habitat."

4.1 Status of the Species

To assess the current status of the species, it is helpful to understand the species' conservation needs which are generally described in terms of reproduction, numbers, and distribution (RND). The Service frequently characterizes RND for a given species via the conservation principles of resiliency (ability of species/populations to withstand stochastic events–numbers, growth rates), redundancy (ability of a species to withstand catastrophic events–number of populations and their distribution), and representation (variation/ability of a species to adapt to changing conditions); collectively known as the three R's.

As described in the Species Status Assessment (Service 2017) Canada lynx conservation needs include:

- Large (hundreds to thousands of square kilometers) boreal forest landscapes with dense horizontal cover and robust populations of its primary prey, the snowshoe hare.

- Long (four plus months) winters with deep, persistent snow
- Connectivity with populations in Canada; however, whether, and if so to what extent, the demographic and/or genetic health of DPS populations relies on periodic immigration from Canadian populations remains uncertain.

Currently, as a whole, the range-wide status of the species varies depending between the different Units in the DPS. The population in Units 1, 2, 3, 4, and 6 are stable; while populations in Unit 5 are unlikely to persist (Service 2017). Resiliency, the ability to withstand stochastic disturbance events, and redundancy, the ability to withstand catastrophic events, are currently exhibited in the Canada lynx DPS by the persistence of individual Canada lynx populations and their broad distribution across the geographic scope of the DPS. Available information indicates that five out of six geographic units in the DPS (all but the Greater Yellowstone Area) currently contain resident breeding Canada lynx populations. Although we lack precise historical and current population-size estimates for all of the geographic units, Canada lynx experts familiar with each unit provided their estimates of the number of resident Canada lynx each unit could potentially support.

The apparent long-term (historical and current) persistence of resident Canada lynx populations in at least four of the six geographic units (Units 1 through 4) and the absence of reliable information indicating that the current distribution and relative abundance of resident Canada lynx are substantially reduced from historical conditions suggest the historical and recent resiliency of Canada lynx populations in the DPS. The current resident population in Unit 6 has also demonstrated resiliency thus far. The large sizes and broad geographic distributions of the areas occupied by resident Canada lynx populations likewise indicate historical and current redundancy in the DPS sufficient to preclude the possibility of extirpation from catastrophic events.

Representation, the ability of a species to adapt to changing environmental conditions over time, is characterized by the breadth of genetic and ecological diversity within and among populations (Lynx SSA Team 2016). Information provided by Canada lynx experts and geneticists indicates high rates of dispersal and gene flow and, therefore, generally low levels of genetic differentiation across most of the species' range, including the DPS (Lynx SSA Team 2016). Hybridization with bobcats has been documented but is not considered a substantial current threat to the DPS (Lynx SSA Team 2016). Despite differences in forest community types and topographic/elevation settings, Canada lynx across the range of the DPS occupy a similarly narrow and specialized ecological niche defined by specific vegetation structure, snow conditions, and the abundance of a single prey species. Thus, Canada lynx naturally have little ability to adapt to changing environmental conditions (i.e., shift to other forest habitats, snow conditions, or prey species). However, although some small populations may have become extirpated recently, resident Canada lynx in the DPS remain broadly distributed across the range of ecological settings that seems to have supported them historically in the contiguous United States. There are no indications of current threats to the genetic health or adaptive capacity of Canada lynx populations in the DPS, and the current level of representation does not appear to represent a decrease from historical conditions.

The primary factors influencing the status include regulations on Federal lands, climate change, state forestry regulations, and wildfires. The lack of regulations protecting Canada lynx habitat

from potential threats on Federal lands at the time of listing has been largely addressed by formal and binding amendments or revisions to most Federal land management plans within the DPS range. Although uncertainty remains about the efficacy of this improved regulatory framework, Federal lands are now being managed specifically to protect and restore Canada lynx habitats, with the goal of supporting continued Canada lynx presence on these lands. Most Federal lands, which constitute 64 percent of Canada lynx habitat, are found in the western United States.

Climate change is occurring at a global and, thus, a DPS-wide scale. Climate warming has reduced snow amount, duration, and quality (in terms of conditions thought to be favorable for Canada lynx); it has been linked to increased frequency, size, and severity of wildfires and forest insect outbreaks; and it likely has already resulted in some changes in forest vegetative communities. Climate warming has also been suggested as contributing to changes in the amplitude, periodicity, and synchronicity of northern hare population cycles, which could alter (and perhaps have already altered) the timing and magnitude of Canada lynx dispersal from Canada into the contiguous United States. If Canada lynx populations in the DPS depend on immigration from Canada which is no longer occurring or has been reduced substantially relative to historical conditions, population declines and an increased likelihood of extirpation among resident DPS populations would be expected. However, whether, and if so to what extent, these climate-mediated factors have influenced current Canada lynx numbers, other demographic parameters, and/or habitat quality and distribution is uncertain and has not been quantified across the range of the DPS or in individual geographic units. Despite uncertainty regarding its influence over current conditions for Canada lynx, climate modeling and expert opinion concur that continued climate warming will adversely impact Canada lynx in the DPS at some point in the future.

There are other current stressors that are not occurring across the entire DPS range but which affect Canada lynx in one or more geographic units. For example, in northern Maine, where most high-quality Canada lynx habitat occurs on private commercial timber lands and is the result of past timber harvests, changes in State forestry regulations (i.e., the Maine Forest Practices Act of 1989) that govern private forest management may currently be facilitating decreases in habitat quantity, quality, and distribution, and may result in reduced Canada lynx numbers. The lack of binding Canada lynx conservation commitments on most private lands may exacerbate this risk to current lynx habitats in Maine. However, the current amount and distribution of high-quality Canada lynx and hare habitats created in Maine by past timber harvest is thought to be several times higher than the likely natural historical condition. In North-central Washington, recent large-scale wildfires have resulted in the temporary loss of over a third of Canada lynx habitat, likely reducing this unit's current Canada lynx population and potentially compromising its current ability to support a resident population until habitats recover. Increased wildfire activity also has impacted Canada lynx habitats in the other western geographic units (Northwestern Montana/Northeastern Idaho, the Greater Yellowstone Area, and Western Colorado), but the extent to which it may have influenced the current condition of Canada lynx populations in those units is uncertain.

For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to Species Status Assessment (Service 2017).

4.2 Status of Critical Habitat

Critical habitat for this species has been designated; however, this action will have no effect on designated critical habitat.

5.0 ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated and/or ongoing impacts of all proposed Federal projects in the action area that have undergone Section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress.

5.1 Status of the Species within the Action Area

This programmatic BO covers potential projects in the states of Maine, Vermont, and New Hampshire, effectively, the Northern Maine Unit (Unit 1). This unit has likely supported resident Canada lynx since at least the southward re-expansion of boreal spruce-fir forests into the northeastern United States during and following the Little Ice Age. Currently, northern Maine is thought to support many more resident Canada lynx than likely occurred historically, and many more than was known or suspected at the time the DPS was listed. This unit currently contains an unnaturally-high amount of high-quality hare habitat; the result of dense conifer regeneration following landscape-level clearcutting in the 1970s and 1980s in response to a large spruce budworm outbreak. These dense young regenerating conifer stands are much more extensive than they are thought to have been historically under natural disturbance regimes.
However, habitat extent probably peaked in the late 1990s and early 2000s, and habitat quality is projected to decline in these stands over the next few decades as they age beyond 35 to 40 years post-harvest. This unit currently is thought to support the largest resident population in the DPS; perhaps 750 to1,000 individual Canada lynx (Lynx SSA Team 2016). This geographic unit may also be the source of dispersing Canada lynx that recently recolonized northern New Hampshire as well as several that temporarily established residency in northern Vermont. Some reproduction has been verified recently in both states, although neither was occupied when the DPS was listed, and resident Canada lynx were thought to have been extirpated from New Hampshire.

5.2 Status of Critical Habitat

Critical habitat for this species has been designated in the action area, specifically in Maine, not in Vermont or New Hampshire; however, this action will have no effect on designated critical habitat.

6.0 EFFECTS OF THE ACTION

Direct effects are the direct or immediate effects of the project on the species, its habitat, or designated/proposed critical habitat. Indirect effects are defined as those that are caused by the

proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. Direct and indirect effects of the proposed action along with the effects of interrelated/interdependent activities are all considered together as the "effects of the action."

The potential effects of the proposed action are described in Table 3. The following project components: suitcase traps, hand nets, zinc phosphide, and gas cartridges; are unlikely to result in any impacts to Canada lynx because they are targeted and/or aren't used where Canada lynx occur, and the WS will follow AMMs 22-23 (suitcase traps), 49 to50 (zinc phosphate), and 51 to 53 (gas cartridges). For those components of the proposed action that are determined to result in "no effect" to Canada lynx, there will be no further discussion in this Opinion.

There are several other components of the project that may affect Canada lynx. The effects of these actions are largely discountable and insignificant, especially with implementation of AMMs, though some are likely to adversely affect Canada lynx, despite the implementation of AMMs. In the cases of potential adverse effects, AMMs will largely attempt to avoid the effects altogether. The effects of these actions are summarized in Tables 3 and in Sections 6.1 to 6.6. For many components of the proposed action that may affect Canada lynx, conservation measures have been incorporated to ameliorate those effects and those are also noted in Table 3, and summarized in Section 2.6.

6.1 Translocation

Translocations of Canada lynx will be carried out only after all other methods have been eliminated as unfeasible or impossible. All translocations would only be carried out using protocols approved by the Service and will be done at the direction of and only after discussion with the Service. To accomplish the response under this activity, the WS may utilize many methods including, but not limited to, cage traps, catch poles, foothold traps, and chemical immobilization. Effects due to these particular methods could range from negligible in the cases where Canada lynx are cooperative and docile, to harm if a Canada lynx attempts to escape a capture device, to death as a result of overdose on drugs administered to ease capture and handling. Adverse effects may also occur as a result of the translocation to a new area. Canada lynx are highly mobile and the individual may attempt to return from considerable distances, decreasing time spend foraging or finding shelter. The new area may be less suitable (smaller prey base, less sheltering opportunities, etc.) leading to a stressed individual attempting to acclimate to the new area. Additionally, the new area may already be occupied, leading to translocated Canada lynx coming into conflict with resident individuals. Careful timing of translocation and selection of release site can markedly improve acclimation and survival rates. Translocating animals also runs the risk of spreading parasites and diseases to previously uninfected areas. Translocation of wildlife is discouraged by the WS's policy (WS Directive 2.501) because of stress to the translocated animal, poor survival rates, difficulties in adapting to new locations or habitats, and potential to spread disease and damage concerns at the new location. However, there are exceptions for the translocation of damaging mammals that might be a viable solution, such as when the mammals are considered to have high value such as

Canada lynx. The WS will follow AMMs detailed in the Section 2.6 to minimize potential effects. Therefore, translocation may affect and is likely to adversely affect Canada lynx.

Table 3. Potential effects of proposed action to Canada lynx.

Sub-activity	***Direct interaction (vehicle strike, crushing, trampling, etc.) OR Indirect interaction (Stressor)*** *(a change in resource quantity or quality-clear descriptor of what can be avoided, minimized, or mitigated)*		***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Avoidance Minimization Mitigation Measures***	***Effects remaining***	***Determination*** *(Not Likely to Adversely Affect [NLAA], Likely to Adversely Affect [LAA])*
	DIRECT interaction	***Indirect interaction (STRESSOR to resource)***	***Resource or Individuals*** *(if direct)*	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/Dispersal)*						
Translocation	Immobilization		Individuals	Adults		Individual Canada lynx–Range of responses from negligible (may remain docile after capture) to harm (may become injured while struggling to escape) to death (may die while trying to escape or as a reaction to chemicals applies to ease translocation)	Ranges from negligible to reduced fitness to reduced survivorship	Negligible to reduction in numbers	1-4	Varies	LAA
	Introduction to novel area		Individuals	Adults		Individual Canada lynx–Negligible (individual easily integrates into new environment) to harm or death (individual struggles to acclimate to new area, conflict with resident individuals)	Ranges from negligible to reduced fitness to reduced survivorship	Negligible to reduction in numbers		Varies	LAA
	Spread of disease or parasites		Individuals	Juveniles Adults		Individual Canada lynx–Negligible to death, depending on severity of newly introduced novel disease or parasites to resident Canada lynx in new area	Ranges from negligible to reduced fitness to reduced survivorship	Negligible to reduction in numbers		Varies	LAA

Table 3. Potential effects of proposed action to Canada lynx.

Sub-activity	***Direct interaction (vehicle strike, crushing, trampling, etc.) OR Indirect interaction (Stressor)*** *(a change in resource quantity or quality-clear descriptor of what can be avoided, minimized, or mitigated)*		***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Avoidance Minimization Mitigation Measures***	***Effects remaining***	***Determination*** *(Not Likely to Adversely Affect [NLAA], Likely to Adversely Affect [LAA])*
	DIRECT interaction	***Indirect interaction (STRESSOR to resource)***	***Resource or Individuals*** *(if direct)*	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/Dispersal)*						
	Remove individual from hazardous situation		Individuals	Juveniles Adults		Individual Canada lynx–Beneficial, Canada lynx is removed from situation that could be detrimental to the Canada lynx's survival	Beneficial, increased fitness, increased survivorship	Beneficial		Varies	NLAA
Cable restraints (non-lethal)	Immobilization, temporary immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (may become temporarily trapped [self-release] or may require release from trap by WS) to harm (may become injured while struggling to escape trap)	Reduced fitness	Negligible	VT & NH: 5-8 ME: 9-13	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA
Cage traps	Immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (may require release from trap by WS) to harm (may become injured while struggling to escape trap)	Reduced fitness	Negligible	14-17	Varies	LAA

Table 3. Potential effects of proposed action to Canada lynx.

Sub-activity	***Direct interaction (vehicle strike, crushing, trampling, etc.) OR Indirect interaction (Stressor)*** *(a change in resource quantity or quality-clear descriptor of what can be avoided, minimized, or mitigated)*		***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Avoidance Minimization Mitigation Measures***	***Effects remaining***	***Determination*** *(Not Likely to Adversely Affect [NLAA], Likely to Adversely Affect [LAA])*
	DIRECT interaction	***Indirect interaction (STRESSOR to resource)***	***Resource or Individuals*** *(if direct)*	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/Dispersal)*						
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA
Clover traps/corral traps	Immobilization, temporary immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (may become temporarily trapped [self-release] or may require release from trap by WS) to harm (may become injured while struggling with trap)	Ranges from negligible to reduced fitness	Negligible	18-21	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA
Catch polls	Restraint, immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (used very short term to immobilize Canada lynx while being released from some other trap, or to apply immobilizing agents to harm (may become injured while struggling with catch pole)	Reduced fitness	Negligible	22	Varies	LAA

Table 3. Potential effects of proposed action to Canada lynx.

Sub-activity	***Direct interaction (vehicle strike, crushing, trampling, etc.) OR Indirect interaction (Stressor)*** *(a change in resource quantity or quality-clear descriptor of what can be avoided, minimized, or mitigated)*		***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Avoidance Minimization Mitigation Measures***	***Effects remaining***	***Determination*** *(Not Likely to Adversely Affect [NLAA], Likely to Adversely Affect [LAA])*
	DIRECT interaction	***Indirect interaction (STRESSOR to resource)***	***Resource or Individuals*** *(if direct)*	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/Dispersal)*						
Culvert traps	Immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (may require release from trap by WS) to harm (may become injured while struggling to escape trap)	Ranges from negligible to reduced fitness	Negligible	25-28	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA
Foothold traps	Immobilization, temporary immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (may become temporarily trapped [self-release] or may require release from trap by WS) to harm (may become injured while struggling to escape trap)	Reduced fitness	Negligible	29-35	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA

Table 3. Potential effects of proposed action to Canada lynx.

Sub-activity	***Direct interaction (vehicle strike, crushing, trampling, etc.) OR Indirect interaction (Stressor)*** *(a change in resource quantity or quality-clear descriptor of what can be avoided, minimized, or mitigated)*		***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Avoidance Minimization Mitigation Measures***	***Effects remaining***	***Determination*** *(Not Likely to Adversely Affect [NLAA], Likely to Adversely Affect [LAA])*
	DIRECT interaction	***Indirect interaction (STRESSOR to resource)***	***Resource or Individuals*** *(if direct)*	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/Dispersal)*						
Cable foot restraints	Immobilization, temporary immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (may become temporarily trapped [self-release] or may require release from trap by WS) to harm (may become injured while struggling to escape trap)	Reduced fitness	Negligible	36-38	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA
Weasel boxes/snap traps	Immobilization, temporary immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Negligible (may become temporarily trapped [self-release] or may require release from trap by WS) to harm (may become injured while struggling to escape trap)	Reduced fitness	Negligible	39-40	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA

Table 3. Potential effects of proposed action to Canada lynx.

Sub-activity	***Direct interaction (vehicle strike, crushing, trampling, etc.) OR Indirect interaction (Stressor)*** *(a change in resource quantity or quality-clear descriptor of what can be avoided, minimized, or mitigated)*		***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Avoidance Minimization Mitigation Measures***	***Effects remaining***	***Determination*** *(Not Likely to Adversely Affect [NLAA], Likely to Adversely Affect [LAA])*
	DIRECT interaction	***Indirect interaction (STRESSOR to resource)***	***Resource or Individuals*** *(if direct)*	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/Dispersal)*						
Bodygrip traps	Immobilization, temporary immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Death (trap is designed as a lethal trap)	Reduced survivorship	Reduction in numbers	41-42	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA
Cable Devices (Lethal)	Immobilization, temporary immobilization		Individuals	Juveniles Adults		Individual Canada lynx–Death (trap is designed as a lethal trap)	Reduced survivorship	Reduction in numbers	VT & NH: 43-47 ME: 48-49	Varies	LAA
		Alteration of foraging behavior (avoidance of trap and surrounding area)	Individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, Reduced feeding success	Negligible	Negligible		Varies	NLAA
Sedation agents (Ketamine, Xylazine, Tiletamine)	Immobilization, alters bodily functions		Individuals	Juveniles Adults		Individual Canada lynx–Beneficial (reduces likelihood of injury to captured individual) to Negligible (administered in a controlled environment by trained individuals) to death (accidental overdose on administered drugs, unexpected reaction to drugs)	Beneficial to negligible to reduced fitness to reduced survivorship	Negligible to reduction in numbers	55-57	Varies	LAA

Table 3. Potential effects of proposed action to Canada lynx.

Sub-activity	***Direct interaction (vehicle strike, crushing, trampling, etc.) OR Indirect interaction (Stressor)*** *(a change in resource quantity or quality-clear descriptor of what can be avoided, minimized, or mitigated)*		***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Avoidance Minimization Mitigation Measures***	***Effects remaining***	***Determination*** *(Not Likely to Adversely Affect [NLAA], Likely to Adversely Affect [LAA])*
	DIRECT interaction	***Indirect interaction (STRESSOR to resource)***	***Resource or Individuals*** *(if direct)*	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/Dispersal)*						
Sedation antagonists (Yohimbine, Tolazoline, Atropine, Doxapram)	Alters bodily functions		Individuals	Juveniles Adults		Individual Canada lynx–Beneficial (reduces likelihood of injury to captured individual) to Negligible (administered in a controlled environment by trained individuals) to death (accidental overdose on administered drugs, unexpected reaction to drugs)	Beneficial (reduces likelihood of injury to captured individual) to negligible to reduced fitness to reduced survivorship	Negligible to reduction in numbers	55-57	Varies	LAA
Antibiotics	Protects against infection		Individuals	Juveniles Adults		Individual Canada lynx–beneficial negligible, administered in a controlled environment by trained individuals to protect against infection when administering sedation agents or antagonists	Beneficial (reduces likelihood of infection in captured individual) to negligible	Negligible	55-57	Varies	NLAA
Shooting		Deposition of lead in environment	Prey, individuals	Juveniles Adults	Feeding	Individual Canada lynx–Negligible, may ingest prey that has an increased lead level or carcasses of mammals that have been shot	Ranges from negligible to reduced fitness	Negligible	58	Varies	NLAA

6.2 Non-lethal Traps

Non-lethal cable restraints, cage traps, clover traps/corral traps, culvert traps, foothold traps, cable foot restraints, and weasel boxes/snap traps are all methods used by the WS that could cause adverse effects to individual Canada lynx through incidental capture while trying to capture target mammals. Effects are largely associated with the individual Canada lynx being immobilized, exposed to the environment while immobilized, attempting to extricate itself from the device, or avoiding the location of the device. These effects can range from negligible in the cases where the Canada lynx are cooperative and docile and are released from the device easily, to injury while attempting to escape a device. None of these devices are expected to cause lethal harm. Additionally, the WS has never had a known instance where use of these devices resulted in harm to a Canada lynx. To further avoid and minimize potential effects the WS will follow AMMs detailed in the Section 2.6. Despite this, in the remote chance that use of these devices results in the incidental capture of a Canada lynx, they may affect and are likely to adversely affect Canada lynx.

6.3 Catch Poles

Catch poles could be used by the WS to allow a safe release of a Canada lynx that was unintentionally captured in a trap. Canada lynx could be adversely affected by the use of a catch pole while attempting to escape or avoid placement in the catch pole. The WS would immediately report to the Service, state wildlife agencies, and/or other trained WS employees, in the event a Canada lynx is incidentally captured and the use of a catch pole is necessary, ensuring a properly trained individual is performing the action. To date, no Canada lynx have been trapped incidentally during normal activities of the WS, and therefore use of a catch pole on a Canada lynx has never occurred. The proper implementation of the AMMs listed in Section 2.6 will further minimize this likelihood. Despite this, in the remote chance that there is an incidental capture of a Canada lynx, the use of a catch pole they may affect and is likely to adversely affect Canada lynx.

6.4 Lethal Traps

Bodygrip traps and lethal cable devices are all methods used by the WS that could cause adverse effects to individual Canada lynx through incidental capture while trying to capture target mammals. Although these devices are designed to be lethal and would kill a Canada lynx if caught, the WS has never had a known instance where a Canada lynx has been captured. To further avoid and minimize potential effects the WS will follow AMMs detailed in the Section 2.6. Despite this, in the remote chance that use of these devices results in the incidental capture of a Canada lynx, they may affect and are likely to adversely affect Canada lynx.

6.5 Non-lethal Chemicals

Several non-lethal chemicals such as sedation agents and sedation antagonists, or antibiotics; are approved and authorized to assist in the handling of live-captured wildlife by the WS. These chemicals could be used on a Canada lynx when translocation of the individual is deemed appropriate or to assist in the releasing of a Canada lynx captured in a live-capture device. If not administered properly, immobilizing agents have the potential to cause effects to a Canada lynx

from an overdose. Even when administered properly, there is the potential for an individual to experience an allergic or adverse reaction to the drug. However, the use of immobilizing drugs is not expected to have any long-lasting effects on Canada lynx. The WS will not leave an individual Canada lynx until it has returned to full and normal function, thereby reducing its chances of succumbing to potential predators or other dangers while still under the influence of a sedation agent. Most drugs used are metabolized and excreted within hours after the individual returns to full function. The use of immobilizing drugs has a degree of beneficial effects, by allowing for a safer release of a Canada lynx unintentionally captured, or by easing translocation from a potentially harmful situation. Additionally, the WS will adhere to AMMs to minimize the risk of adversely affecting a Canada lynx when administering a non-lethal drugs as detailed in the Section 2.6. Therefore, the use of non-lethal chemicals may affect and is likely to adversely affect Canada lynx.

6.6 Shooting

Though the act of shooting is a highly targeted action and in of itself will have no effect on Canada lynx, deposition of lead in the environment in the carcasses of targeted mammals or when an attempted shooting misses its target may result as a consequence of this action. Though the WS will make every attempt to remove carcasses and spent ammunition by following the AMMs listed in Section 2.6, not all lead will be retrieved. Some of this lead may be consumed by an individual Canada lynx scavenging on the carcass of a targeted mammal or if a Canada lynx prey item has ingested lead deposited in the environment. Though the effects of lead ingestion can be harmful and may decrease the fitness of an individual Canada lynx, these effects are both discountable (it is highly unlikely that a Canada lynx would be in the area and would also scavenge a targeted animal that could not be retrieved, or would eat prey with increased lead levels as a result of stray ammunition), and insignificant (the amount of lead deposited in the environment would be very low with adherence to the AMMs), and therefore this action may affect but is not likely to adversely affect Canada lynx.

7.0 CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, and private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 (a)(2) of the ESA. The programmatic action area encompasses the entire geographic range of the Canada lynx in Maine, New Hampshire, and Vermont; an extensive area of land. Hence, an array of future state, tribal, local, and private actions are likely to occur. Individual projects covered by this consultation will have much smaller action areas (a micro-fraction of the entire range of Canada lynx). The range of the Canada lynx contains relatively little Federal land. Reasonably foreseeable non-Federal activities will include (but are not limited to) agriculture, forestry, municipal infrastructure maintenance, residential and commercial/industrial development, energy projects, and recreational fishing. Within each of these broad categories, a variety of actions that could affect Canada lynx and their habitat include water withdrawal to irrigate crops, logging roads, non-point source pollution from residential and commercial development, and loss of forest and other natural habitats from development, recreation, and private hunting and trapping.

Forestry and agricultural concerns, an ongoing activity often with no Federal nexus, can result in altered or degraded habitat within the range of the Canada lynx. Habitat alterations and degradation may increase if crop acreages increase or forestry practices change. Reduction in suitability can affect Canada lynx. Many areas with suitable Canada lynx habitat are subject to recreational pressure, including all-terrain vehicles, snowmobiles, hiking, biking, and trapping and hunting. Where occupied Canada lynx habitat and recreation intersect, there is a possibility for adverse effects. Canada lynx behavior may be altered by recreating individuals and Canada lynx may be incidentally caught by trappers. Many activities that impact suitable Canada lynx habitat require Federal permits from the Corps under the Clean Water Act and Rivers and Harbors Act, or other Federal permits or funding. Therefore, these potential future actions (state, tribal, local, and private) that will affect Canada lynx and critical habitat will be subject to ESA section 7(a)(2) consultation.

Maine's total population, as of July 2015, was 1,329,328 compared to 1,125,043 in 1980 (18.2 percent growth over 35 years). Maine's population is expected to grow by 11.5 percent through 2030 (Census Bureau 2012). Subsequently, patterns and types of land use and development are not expected to dramatically change relative to trends seen over recent decades. Activities that have affected Canada lynx and their habitat in recent years are expected to continue relatively unchanged, although various efforts at conservation have and will continue to benefit Canada lynx (e.g., conservation easements). Projects as a part of this action are not expected to increase development for residential or commercial use.

8.0 ANALYTICAL FRAMEWORK FOR JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

8.1 Jeopardy Determination

Section 7(a)(2) of the ESA requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

8.2 Jeopardy Analysis Framework

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The following analysis relies on 4 components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. The jeopardy analysis in this Opinion emphasizes the range-wide survival and recovery needs of the listed species and the role of the action area in providing for those needs. It is within this context that we evaluate the significance of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

8.3 Destruction/Adverse Modification Analysis Framework

The final rule revising the regulatory definition of "destruction or adverse modification of critical habitat" became effective on March 14, 2016 (81 FR 7214). The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features." The proposed action will have no effect on designated critical habitat; therefore it will not be analyzed for destruction or adverse modification.

8.4 Analysis for Jeopardy

8.4.1 Impacts to Individuals

The proposed action includes several methods of trapping, shooting, and chemical control of mammals. As discussed in the Effects of the Action, Sections 6.0, potential effects of the action include effects to Canada lynx present within the action area. Effects would be the result of individual Canada lynx incidentally getting caught in traps or the WS participating in a Canada Lynx Response Team call, though, to date, no Canada lynx have been trapped as a result of WS activities and the WS hasn't responded to a Canada Lynx Response Team call. Despite this, as has been shown by data collected by the MDIFW trapping programs (MDIFW 2015, Service 2014), Canada lynx can get trapped incidentally to otherwise legal trapping. The MDIFW and the Service anticipate that rates of incidental Canada lynx capture in traps will remain low (13 per year [195 Canada lynx over 15 years]), and the rates of lethal trapping of Canada lynx even lower (0.2 per year [3 Canada lynx over 15 years]), and this is a conservative estimate, actual numbers are likely to be lower (MDIFW 2015, Service 2014). The SOPs, such as implementation of trap placement, trap size specifications, and bait use are proposed as part of the action in order to avoid and minimize adverse effects to Canada lynx. These SOPs were developed based on past consultation history, research and literature, and experience with Canada lynx impacts from similar activities. Since the WS must commit and adhere to all the SOPs, this further helps to ensure that the WS are avoiding and minimizing effects to Canada lynx to the extent possible. Though implementation of the SOPs will greatly reduce the already low likelihood of Canada lynx getting trapped, there will be impacts to individuals, ranging from harassment (an individual is caught and escapes or is released unharmed) to harm (an individual is caught and escapes or is released with minor injuries) to death (an individual is caught and can't be released due to injuries or dies in the trap).

8.4.2 Impacts to Populations

As we have concluded that individual Canada lynx are likely to be harmed, we will assess the aggregated consequences of the anticipated losses/reductions in fitness (i.e., reproductive success and long-term viability) of the exposed individuals on the population to which these individuals belong. Canada lynx are highly dispersed across the landscape within occupied habitat and individual actions proposed as part of this PBO will likely only affect a single individual at a time. Additionally, no part of the proposed actions covered by this PBO will affect habitat in any way. The effects are not expected to measurably decrease the fitness of these individuals for

several reasons. The SOPs will be implemented that are designed to decrease the likelihood of Canada lynx being attracted to, caught in, or permanently held by a trap. In the highly unlikely chance that a Canada lynx is caught and held, the SOPs that require that traps are checked frequently and placed in areas that will minimize environmental exposure of the individual, limit affects to the level of non-lethal harm or harassment, as opposed to lethal levels.

Although the magnitude of several of the effects of these actions cannot be precisely determined, we do not anticipate that they will occur at levels that would reduce Canada lynx populations at the action area scale or range-wide scale over the next five years. Based on data from the MDIFW's trapping program (MDIFW 2015, Service 2014), fewer than eight individuals are anticipated to be either harmed or harassed over five years through implementation of the activities carried out by the WS and described in this PBO. The total population estimated in the entire range of Canada lynx in Maine, Vermont, and New Hampshire, is approximately 750 to 1,000 individuals. The estimated eight individuals "taken" by the proposed action over five years equates to 0.8 to 1.1 percent of the entire estimated population of Canada lynx in the action area. Additionally, for reasons described above, the majority of this "take" does not result in death or loss of individuals from the populations, but can result in temporary impacts that meet one of the technical definitions of "take" but do not result in mortality. Therefore, we do not anticipate a long-term reduction in any fitness because of the extremely low number of individual Canada lynx trapped.

8.4.3 Impacts to Species

As we have concluded that population of Canada lynx are unlikely to experience reductions in their fitness, therefore there will be no harmful effects (i.e., there will be no reduction in RND) on the species as a whole.

8.5 Conclusion

We considered the current overall stable status of Canada lynx and the similar condition of the species within the action area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the action area on individuals, populations, and the species as a whole. These types of effects of the proposed action are currently considered primary factors influencing the status of the species. While they may compound those factors, as stated above, we do not anticipate any reductions in the overall RND of Canada lynx. It is the Service's opinion that the programmatic action, as proposed, is not likely to jeopardize the continued existence of the Canada lynx.

9.0 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering (50 CFR § 17.3). Harass is defined by the Service as intentional or negligent actions that create the

likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the WS so that they become binding conditions, as appropriate, for the exemption in Section 7(o)(2) to apply. The WS has a continuing duty to regulate the activity covered by this incidental take statement. If the WS: (1) fails to assume and implement the terms and conditions of the incidental take statement, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of incidental take, the WS must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

9.1 Amount or Extent of Take Anticipated

The Service analyzed the effects to the species above. Take estimates are calculated based on data collected by the WS (trap nights) and data collected by the MDIFW's trapping program (MDIFW 2015, Service 2014). Based on the rate of incidental trapping of Canada lynx in the MDIFW's data, the Service extrapolated the potential for take of the WS's program as a product of expected trap nights. This is summarized in Table 4.

Table 4. Canada Lynx Trapping Rates Based on the MDIFW (2015) and the Service (2014) 2005 to 2013 Data.

Trapping, non-lethal type	
Non-lethal type trap nights per year	110,000
Canada lynx trapped (2005-2013)	58
Average Canada lynx trapped per year	6.4
Canada lynx trapped per trap night	**0.00006**
Trapping, lethal type	
Lethal-type trap nights per year	150,000
Canada lynx trapped (2005-2013)	6
Average Canada lynx trapped per year	0.7
Canada lynx trapped per trap night	**0.000004**

Additionally, we anticipate that the WS will respond once per year to a call from the Canada Lynx Response Team. The anticipated take estimate for the next five years is eight Canada lynx (three from trapping and five from responding to calls from the Canada Lynx Response Team). This calculation is summarized in Table 5 below. The take for this proposed action can be broken into lethal and non-lethal. As part of the MDIFW's trapping program, they anticipated that 94 percent of the take as a result of their trapping program will result in Canada lynx released with no injuries or with minor injuries; while 4.4 percent will be released after treatment and 1.6 percent will die or need to remain in care (MDIFW 2015, Service 2014). For the WS's program, the majority of take will be non-lethal as it would occur either in a non-lethal type trap

or it would be during a response to a call from the Canada Lynx Response Team; a portion of the WS's program that ultimately benefits Canada lynx by removing them from a potentially lethal situation.

Table 5. Summary of program components used to calculate take to Canada lynx as a result of activities conducted by WS in Maine, Vermont, and New Hampshire.

Trapping, non-lethal type	
Cable restraints	127
Cage traps	6,357
Clover/corral traps	255
Culvert traps	172
Foothold traps	555
Cable foot restraint	50
Weasel boxes/snap traps	1,638
Total average annual trap nights	9,154
Extrapolated Canada lynx trapped per year	0.5
Total take over five years	2.68
Trapping, lethal type	
Bodygrip traps	1,469
Cable devices	257
Total average annual trap nights	1,726
Canada lynx trapped per year	0.008
Total take over five years	0.04
Total trapping take over five years, non-lethal plus lethal type traps[1]	3 (2.72)
Canada Lynx Response Team (CLRT)	
Annual Responses to CLRT calls (take per year)	1
Total take over five years	5
Total program take over 5 years[1]	**8** (7.72)

[1] Total take has been rounded up to the nearest whole number, pre-rounded number is in parentheses.

9.2 Reasonable and Prudent Measures

Due to the inclusion of the AMMs in the proposed action, the only required reasonable and prudent measure is that all AMMs and project descriptions as described in Section 2 of this PBO must be followed.

9.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the WS must comply with the following terms and conditions, which implement the reasonable and prudent measure described above and outline the required monitoring and reporting requirements. These terms and conditions are nondiscretionary.

- All applicable SOPs described in this PBO will be fully implemented.
- The WS will generate an annual report for submittal to the Service. This report will summarize program use and take for the reporting year, information that may inform potential effect assumptions, and implementation of conservation measures (for the sake of this PBO, "year" refers to the calendar year, January 1 to December 31) and will be submitted to the Service by March 1 of the year following the activities.
- If take of Canada lynx occurs while the WS is carrying out the proposed action, it will be reported within one week of the take occurring to the Service.

10.0 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service requests notification of the implementation of any conservation recommendations and to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

- We suggest that the WS continue to investigate and implement new measures that will decrease the likelihood of take of Canada lynx.

11.0 REINITATION NOTICE

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. If you have any questions regarding this Opinion, our response to your concurrence request, or our shared responsibilities under the ESA, please contact Anna Harris by telephone at 207/902-1567 or by email at *Anna_Harris@fws.gov*.

Sincerely,

ANNA HARRIS

Digitally signed by ANNA HARRIS Date: 2018.04.27 13:23:21 -04'00'

Anna Harris, Project Leader Maine Field Office
Maine Fish and Wildlife Service Complex

12.0 CONSULTATION HISTORY

- April 6, 2016–Initial draft biological assessment submitted.
- June 17, 2016–The Service submits comments on draft biological assessment to the WS.
- August 22, 2017–Final BA submitted.
- April 27, 2018–PBO finalized and signed

13.0 LITERATURE CITED

AFWA. 2006. Best management practices for trapping in the United States. Washington, D. C.

AFWA. 2016. Trapper Education Manual. URL: *https://www.fishwildlife.org/afwa-inspires/furbearer-management*; accessed April 27, 2018

Census Bureau. 2012. Statistical Abstract of the United States: 2012.

Johnson, M.R., R.G. McLean, and D. Slate. 2001. Field operations manual for the use of immobilizing and euthanizing drugs. U.S. Department of Agriculture, WS Operational Support Staff. Riverdale, Maryland, USA.

Lynx SSA Team. 2016a. Canada Lynx Expert Elicitation Workshop-Final Report. April 18, 2016.

MDIFW. 2015. Incidental take plan for Maine's trapping program. Plan as accepted October 28, 2014. Minor amendments September 24, 2015. Augusta, Maine.

Polechla, P.J. and Walker, S. 2008. Range extension and a case for a persistent population of river otters *(Lontra Canadensis)* in New Mexico. International Union for Conservation of Nature Otter Specialist Group Bulletin 25(1): 13-22.

Service. 2014. Findings and recommendations on issuance of an Incidental Take Permit to the Maine Department of Inland Fisheries and Wildlife. Hadley, Massachusetts.

Service. 2017. Species Status Assessment for the Canada lynx *(Lynx canadensis)* Contiguous United States Distinct Population Segment. Version 1.0, October, 2017. Lakewood, Colorado.