ENVIRONMENTAL ASSESSMENT:
MAMMAL DAMAGE MANAGEMENT IN OHIO

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In Cooperation With:

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SUMMARY

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

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

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

ACRONYMS

ADC[1]	Animal Damage Control
AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CDC	Center for Disease Control
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
DEA	Drug Enforcement Administration
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
HPS	Hantavirus Pulmonary Syndrome
ODW	Ohio Department of Natural Resources
ODA	Ohio Department of Agriculture
ODH	Ohio Department of Health
ODW	Ohio Division of Wildlife
IWDM	Integrated Wildlife Damage Management
MDM	Mammal Damage Management
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	Natural Historic Preservation Act
NOA	Notices of Availability
NRCS	Natural Resources Conservation Service
NWRC	National Wildlife Research Center
SOP	Standard Operating Procedure
TB	Tuberculosis
T&E	Threatened and Endangered
USACE	United States Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	United States Department of the Interior, Fish and Wildlife Service
WDM	Wildlife Damage Management
WS[1]	Wildlife Services
WNV	West Nile Virus
ZP	Zinc Phosphide

[1] On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services (WS).

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CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with the needs of wildlife which increases the potential for conflicting human/wildlife interactions. Management of wildlife damage and conflicts is complicated by the wide range of public responses to wildlife and wildlife damage. What may be unacceptable damage to one person may be a normal cost of living with nature to someone else.

Wildlife damage management (WDM) is the science of reducing damage or other problems associated with wildlife, and is recognized as an integral part of wildlife management (The Wildlife Society 1992). The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (WS) program is a cooperatively funded, service-oriented program that receives requests for assistance with wildlife damage management from private and public entities, including other governmental agencies. Authority for WS' involvement in wildlife damage management is provided in the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). This environmental assessment (EA) was prepared to evaluate the potential environmental effects of alternatives for WS involvement in mammal damage management (MDM) in Ohio.

Wildlife Services activities are conducted to prevent or reduce wildlife damage to agricultural, industrial and natural resources; property; livestock; and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, private organizations, and individuals. The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (WS Directive 2.105[1]), in which a combination of methods may be used or recommended concurrently or sequentially to reduce wildlife damage. These methods may include non-lethal techniques like alteration of cultural practices, habitat management, repellents, frightening devices, and physical exclusion to prevent or reduce damage. The reduction of wildlife damage may also require removal of individual animals, reduction in local animal populations, or elimination of non-native species through lethal means. Wildlife Services' activities are not based on punishing offending animals but are conducted to reduce damage and risks to human and livestock health and safety, and are used as part of the WS Decision Model (Slate et al. 1992; WS Directive 2.101; Chapter 3 of this EA). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated.

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions may be categorically excluded (7 Code of Federal Regulation (CFR) 372.5(c), 60 Fed. Reg. 6,000 -6,003, (1995)). Wildlife

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

Services has decided in this case to prepare this EA to facilitate planning, interagency coordination and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts.

1.1 PURPOSE OF THIS EA

The purpose of this EA is to address and evaluate the potential significant or cumulative impacts on the human environment from alternatives for WS involvement in the protection of agricultural resources, natural resources, property, livestock, and public health and safety from damage and risks associated with mammals in Ohio. Several mammal species have potential to create conflicts or cause damage in Ohio including:

Furbearers: coyotes (*Canis latrans*), raccoons (*Procyon lotor*), Virginia opossums (*Didelphis virginianus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), mink (*Mustela vison*), bobcat (*Lynx rufus*), badger (*Taxidea* taxus), long-tailed weasel (*Mustela frenata*), short-tailed weasel (*Mustela erminea),* least weasel (*Mustela nivalis*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethica*), river otter (*Lutra canadensis*)

Captive Ungulates: elk (*Cervus Canadensis*), reindeer (*Rangifer tarandus*), Sika deer (*Cervus nippon*), fallow deer (*Dama dama*)

Rabbits and Hares: eastern cottontail rabbit (*Sylvilagus floridanus*), snowshoe hare (*Lepus americanus*)

Mice, voles and shews: deer mouse (*Peromyscus maniculatus*), white-footed mouse (*Peromyscus leucopus*), eastern harvest mouse (*Reithrodontomys humulis*), meadow jumping mouse (Zapus *hudsonius),* woodland jumping mouse (*Napaeozapus insignis*), meadow vole (*Microtus pennsylvanicus*), prairie vole (*Microtus ochrogaster*), pine vole (*Microtus pinetorum*), southern red-backed vole (*Clethrionomys gapperi*), least shrew (*Cryptotis parva*), northern short-tailed shrew (*Blarina* brevicauda), pygmy shrew (*Sorex hoyi*), smokey shrew (*Sorex fumeus*).

Moles: eastern mole (*Scalopus aquaticus*), hairy-tailed mole (*Parascalops* breweri), star-nosed mole (*Condylura cristata*)

Squirrels: gray squirrel (*Sciurus carlolinensis*), fox squirrel (*Sciurus niger*), red squirrel (*Tamiasciurus hudsonicus*), southern flying squirrel (*Glaucomys volans*)

Other rodents and marmots: bats (*Myotis*), woodchuck (*Marmota monax*), Eastern chipmunk (*Tamias striatus*), southern bog lemming (*Synaptomys cooperi*), and thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), porcupine (*Erethizon dorsatum*)

Non-native species: feral swine (*Sus scrofa*), feral cat (*Felix* sp.), domestic/feral dog (*Canis familiaris*), exotic carnivores, wolf-dog hybrids (*Canis* sp.), house mouse (*Mus musculus*), brown (Norway) rat (*Rattus norvegicus*), nutria (*Myocastor coypus*).

1.2 NEED FOR ACTION

Conflicts between humans and wildlife are common in Ohio. Wildlife Services and the Ohio Division of Wildlife (ODW) receive requests for assistance with wildlife damage from the public and state, federal and local government agencies. Comprehensive surveys of mammal damage in Ohio have not been conducted, but WS does maintain a Management Information System (MIS) database to document assistance that the program provides in addressing wildlife damage conflicts. Table 1-1 provides a summary of technical assistance projects (advice/ recommendations) completed by the Ohio WS program for Fiscal Years 2007-2012. This table does not include data from hands-on operational projects conducted by WS. This table is an underestimate of total wildlife damage and conflicts because MIS data are limited to information that is collected from people who have requested services or information from WS. This table does not include requests received or responded to by local, State or other Federal agencies or private companies. It also does not include conflicts that landowners/managers have resolved on their own. However, the MIS data do provide an indication of the types of wildlife damage and conflicts which occur in Ohio.

The ODW has management responsibility for resident mammals and conducts management programs for furbearers, game species, and non-game mammals. Wildlife Services' potential involvement in the area of MDM would be to provide basic recommendations, refer callers to the ODW as needed, and to provide direct management assistance with the implementation of mammal damage management programs upon request and as permitted or otherwise authorized by the ODW or other applicable regulatory agency (e.g., Ohio Department of Health or Ohio Department of Agriculture). Examples of WS direct mammal damage management programs conducted by WS include reduction of coyote depredation on livestock on private property, management of raccoons on county, state and federal property to prevent the spread of wildlife diseases, management of woodchucks on U.S. Army Corps of Engineers property to prevent damage to earthen dikes and levees, as well as mammal hazard management at airports. Additionally, WS cooperates with state and federal agencies to assess disease risks involving wild and feral mammals.

Table 1-1. Annual number of requests for technical assistance involving mammals for Ohio Wildlife Services during 2007-2012.

	Type of Damage or Conflict				
Fiscal Year	**Agriculture**	**Human Health and Safety**	**Property**	**Natural Resources**	**Total**
2007	43	29	66	0	138
2008	39	36	92	1	168
2009	34	76	86	1	197
2010	41	64	46	8	159
2011	84	72	113	17	286
2012	65	53	17	68	203

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

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

Zoonotic Diseases. Zoonotic diseases are diseases of animals which are communicable to humans. Some of the mammals may carry disease organisms or parasites including viral, bacterial, mycotic (fungal), protozoan and rickettsial diseases which pose a risk to humans.

In most cases, the risk to humans from the diseases discussed below is low and there may not have been a confirmed case of the disease in the state. However, it is the goal of agricultural and human health programs to prevent disease or illness from occurring. Property owners/managers that request assistance with mammals frequently are concerned about the risk of disease transmission but are unaware of the types of diseases that can be associated with mammals. Wildlife Services works with cooperators on a case-by-case basis to assess the nature and magnitude of the wildlife conflict including providing information on the limitations about what we know regarding health risks associated with wild mammals. It is the choice of the individual cooperator to tolerate the potential health risks or to seek to reduce those risks. In the majority of cases in which human health concerns are a major reason for requesting MDM, there may have been no actual cases of transmission of disease to humans by mammals to prompt the request. Thus, it is the risk of disease transmission that is the primary reason for requesting and conducting MDM

Wildlife Services' primary involvement in the management of these types of diseases would be to conduct and aid other Federal, State, and local government and research entities in conducting monitoring for the presence or absence of diseases in wildlife. This data can be used to predict potential risks to human health and safety and aid agencies in directing management efforts. In the unlikely event of a disease outbreak, WS could also be asked to conduct localized population reduction to prevent spread of disease to other areas. The following section includes examples of

zoonotic diseases which WS may be asked to help address (Table 1-2). WS could become involved in surveillance for and management of zoonotic diseases not listed in this section if methods used and cumulative impacts of project actions are within parameters analyzed in this EA. Additional environmental analyses would be prepared in accordance with the CEQ, USDA and APHIS NEPA implementing regulations for projects involving methods or potential impacts outside the scope of this analysis.

Hantavirus Pulmonary Syndrome was first recognized in North America when a cluster of cases was diagnosed in the southwestern US. Infection in humans causes acute, severe respiratory disease with a mortality rate of 38%. Rodents are the primary reservoir hosts of hantavirus and are asymptomatic carriers. Human infection occurs when virus particles aerosolized from rodent urine, feces, or saliva are inhaled or by handling rodents (Davidson and Nettles 1997). Antibody to Hanta-related virus was found in wild rats collected in Columbus and Cincinnati Ohio in 1983 (J. Infectious Disease, July 1985: 152 (1): 126-136). However, there were no known human cases of hantavirus reported in or contracted in Ohio as of December 14, 2012 (CDC 2012).

Table 1-2. Wildlife Diseases That Pose Potential Human Health Risks in the United States (modified from Davidson and Nettles 1997).

Disease	**Causative Agent**	**Hosts**
Anthrax	bacterium (*Bacillus antracis*)	cattle, sheep, horses, swine, white-tailed deer, dogs, cats
Dermatophilosis	bacterium (*Dermatophilus congolensis*)	mammals (wild and domestic)
Demodectic mange	mange mite (*Demodex odocoilei*)	White-tailed deer
Sarcoptic mange	mite (*Sarcoptes scabiei*)	red foxes, coyotes, domestic dogs
Swine brucellosis	bacterium (*Brucella suis*)	swine
Trichinosis	nematode (*Trichinella spiralis*)	swine, bears, raccoons, foxes, rats
Rabies	virus (Rhabidovirus)	all mammals (high risk wildlife: raccoons, fox, skunks, bats)
Visceral larval migrans	nematode (*Baylisascaris procyonis*)	raccoons, skunks
Leptospirosis	bacteria (*Leptospira interrogans*) over 180 different serovars	All mammals
Echinococcus infection	tapeworm (*Echinococcus multilocularis*)	foxes, coyotes
Bovine brucellosis	bacterium (*Brucela abortus*)	cattle & captive bison(evidence from Texas that organism has infected coyotes that scavenged aborted fetuses and placentas of infected cattle)

Disease	Causative Agent	Hosts
Toxoplasmosis	protozoan parasite (*Toxoplasma ondii*)	Cats, such as bobcats, are definitive hosts, mammals and birds are intermediate hosts
Spirometra infection	tapeworm, (*Spirometra mansonoides*)	bobcats, raccoons, foxes, dogs, cats
Murine typhus	bacteria (*Rickettsia mooseri* = R. *typhi*)	rats, mice, as hosts for primary flea, louse or mite host
Giardiasis	protozoan parasite (*Giardia lamblia, G. Duodenalis*, and other *Giardia* sp.-taxonomy controversial)	beavers, coyotes, dogs, cats
Hantavirus Pulmonary Syndrome	Hantaviruses	Rodents
Histoplasmosis	*Histoplasma capsulatum*	Fungus occurs in bat guano
Lyme Disease	*Borelia burgdorferi* (spirocheate)	Rodents
Plague	*Yersinia pestis*	Rodents
Rocky Mountain Spotted Fever	*Rickettsii rickettsii*	Dogs and Rodents
Salmonellosis	*Salmonella enterica*	Feral Swine
E. Coli	*Escherichia coli*	All mammals
Tularemia	*Francisella tularensis*	Rodents and lagomorphs

Tularemia, also known as "rabbit fever" is a disease caused by a bacterium. Tularemia typically infects animals such as rodents, rabbits, and hares. Usually, people become infected through the bite of infected ticks or tabanid flies, by handling infected sick or dead animals, by eating or drinking contaminated food or water, or by inhaling airborne bacteria (CDC 2011). Less than 200 human cases of tularemia are reported each year in the U.S. Most cases occur in the south-central and western states; however cases have been reported in every state except Hawaii. Without treatment with appropriate antibiotics, tularemia can be fatal (CDC 2011). The causative agent of tularemia is one of the most infectious pathogenic bacteria known, requiring as few as 10 organisms to cause disease. The Working Group on Civilian Biodefense considers tularemia to be a dangerous potential biological weapon because of its extreme infectivity, ease of dissemination, and substantial capacity to cause illness and death (Dennis et al. 2001). There were five cases of tularemia reported in Ohio during the period of 2001-2011 (CDC 2011).

Tuberculosis (TB) in humans is a disease caused by bacteria called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but TB bacteria can attack any part of the body such as the kidney, spine, and brain. If not treated properly, TB can be fatal and TB was once the leading cause of death in the United States. TB is spread through the air from one person to another. The bacteria are put into the air when a person with active TB in the lungs or throat coughs or

sneezes. People nearby may breathe in these bacteria and become infected. In rare instances, TB can also be caused by a species of the *M. tuberculosis* complex called *Mycobacterium bovis* which primarily infects cattle. Humans most commonly become infected with this strain of TB through consumption of unpasteurized milk products from infected cows. For example, from 2001-2004, 35 *M. bovis* cases were identified in New York City. Preliminary findings indicate that fresh cheese (e.g., queso fresco) brought to NYC from Mexico was a likely source of infection (CDC 2005). Human TB caused by *M. bovis* in the U.S. is rare because of milk pasteurization and culling of infected cattle herds. In 1917, the federal government established a bovine TB eradication program. Livestock in most states in the U.S. have been declared free of the disease (USAHA 2004). However, TB has been found in wild white-tailed deer and in dairy herds in the Northern Lower Peninsula of Michigan (Michigan TB Eradication Project 2004*a*, MDNR unpublished data, see also impacts on agriculture). Bovine TB has also been detected in white-tailed deer exposed to infected cattle in northern Minnesota. In January 2005, the first-known case of transmission of TB from deer to humans was reported in Michigan. The hunter was infected when he cut his hand while gutting an infected deer. The hunter was treated with special antibiotics and was expected to make a full recovery.

Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal. Rabies is preventable, but it is fatal without prior vaccination or post-exposure treatment. In 2010, 3,641 wild animals were tested for rabies in Ohio through a joint effort by the Ohio Department of Health and WS. Positive sample verification and rabies variant identification was conducted by the U.S. Centers for Disease Control and Prevention. Forty one bats (5.5% of bats tested), two raccoons (0.3% of raccoons tested), three skunks (2.8% of skunks tested), and one calf (0.05% of other animals tested) were positive for rabies in 2010 (ODH 2011). The 2008-2009 annual average was 49 bats (2.7%), 3 raccoons (0.0001%), 3 skunks (0.8%) and 1.1 other mammals (0.02%; ODH 2011). Ohio WS' involvement in rabies research and management is addressed in the WS nationwide EA on rabies management (USDA 2009).

Foreign Animal Diseases: International trade and travel and the popularity of exotic pets have resulted in an ongoing risk of foreign animal disease introduction. In some cases, these diseases may be transmissible to humans. For example, in 2003, a case in Wisconsin involved 16 individuals diagnosed with monkeypox, along with 65 individuals in five other Midwestern states being diagnosed as having contracted monkeypox from pet prairie dogs and/or other exotic rodents (APHIS 2003). Symptoms of monkeypox in humans included fever, cough, rash and swollen lymph nodes. The prairie dogs were believed to have contracted the disease from African rodents imported for sale as pets. As part of the investigation of the incident, Wisconsin WS was requested to conduct surveillance in wild rodent populations around the residences of individuals with infected prairie dogs to see if native rodents had been exposed to the virus. In the event of a foreign animal disease outbreak in Ohio, WS could be requested to provide similar assistance and/or aid USDA, APHIS, Veterinary Services (VS) or State Animal and Human Health authorities in the management of animals involved in the outbreak.

Examples of Disease Concerns Involving Wild and Feral Mammals in Ohio:

- Beaver damming activity creates conditions favorable to certain types of mosquitoes and can hinder mosquito control efforts or result in population increases of these insects (Wade and Ramsey 1986). While the presence of these insects is largely a nuisance, mosquitoes can transmit diseases, such as Eastern equine encephalitis (Mallis 1982) and West Nile Virus (WNV) (CDC 2000). In Ohio, West Nile virus was first identified in 2001 when laboratory tests confirmed its presence in six dead birds from three counties. The following year, the state's first two human cases from West Nile disease were reported in Cuyahoga and Franklin counties. The number of West Nile Virus Cases in Ohio varies substantially among years. From January 1 through October 18, 2012, there were 133 human cases of West Nile Virus including 6 fatalities in the state (ODH 2012). However in 2011, there were only 21 cases and one fatality.

- Beaver can carry the genotypes of the intestinal parasite *Giardia lamblia* proven to cause disease in humans and can potentially be a source of water contamination (Fayer et al. 2006, Sulaiman et al. 2003, Appelbee et al. 2002). Although the term "beaver fever" is used to refer to giardiasis, as noted, beaver are not the only source for *Giardia* contamination (Erlandsen et al. 1996). Other wildlife species such as muskrats, voles and wading birds can have higher rates of infection with *Giardia* than those observed in beaver (Trout et al. 2005, Dunlap and Theis 2002, Heitman et al. 2002). Contamination with human waste or runoff from livestock facilities can also be a significant source of *Giardia* contamination (Heitman et al. 2002, Erlandsen and Bemrick 1988, Erlandsen 1993, Suck et al. 1987). In the study conducted by Heitman et al. (2002) contamination with human waste and runoff from livestock facilities appeared to be the primary sources of *Giardia* contamination in their study. However, they noted that the impact of aquatic mammals on water quality needed separate assessment. It is possible that aquatic mammals may contract *Giardia* from water infected by human or livestock waste. The aquatic rodents, in turn, may serve as reservoirs for these agents and may amplify background levels of contamination (Heitman et al. 2002).

- Beaver are also known carriers of tularemia, a bacterial disease that is transmittable to humans through bites by arthropod vectors or infected animals or by handling animals or carcasses which are infected (Wade and Ramsey 1986). Skinner et al. (1984) found that in cattle-ranching sections of Wyoming the fecal bacterial count was much higher in beaver ponds than in other ponds, something that can be a concern to farmers and recreationists. On rare occasions, beaver may contract the rabies virus and attack humans. In August 2012, a Boy Scout leader that was swimming in the Delaware River, in Pennsylvania and was bitten multiple times by a beaver. The animal was subsequently euthanized and tested positive for rabies (Feldman 2012). In September 2012, a rabid beaver attacked a woman leaving a lake in Fairfax County Virginia (Jouvenal 2012).

- Feral Swine, including domestic, Eurasian, or hybrid crosses have become established in several areas in Ohio and pose a severe disease transmission threat to humans and the livestock industry. They are significant disease reservoirs and can carry up to 30 diseases

and a minimum of 37 parasites. Many of these diseases are transmissible to humans and include brucellosis, leptospirosis, salmonellosis, toxoplasmosis, sarcoptic mange, E. coli and trichinosis. These diseases are transmitted through contact with urine, feces and reproductive tract material, as well as consuming undercooked pork. Human infection by *Brucella* bacteria is not uncommon. Health officials in Florida documented that eight of ten human cases of brucellosis in 2007 were linked to wild pig hunting activities (Florida Department of Health 2008). Feral swine have expanded their range in Ohio and have been sighted in at least 24 counties, with confirmed populations mostly in the south east portion of the state.

- Feral cats serve as major reservoirs for the bacterium *Bartonella* spp. Feral 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 rather by scratches or bites from pet cats infected by flea bites. Human infections that may result from exposure of this bacterium via stray cats include: cat scratch disease and hepatic peliosis in immunocompromized patients, bacillary angiomatosis, endocarditis, bacteremia, osteolytic lesions, pulmonary nodules, neuroretinitis, and neurologic diseases (Heller et al. 1997). In areas where dog rabies has been eliminated, but rabies in wildlife has not, cats often are the most significant domestic animal contracting rabies and presenting a subsequent risk of transmission to humans (Eng and Fishbein 1990; Krebs et al. 1996; Vaughn 1976).

- Norway rats, roof rats and house mice live in close association to human habitations and provide a potential source of disease transmission. The Norway rat and house mouse are the domestic rodents of public health concern in Ohio. Many of the diseases associated with these species are transmitted to humans and animals through primary hosts such as fleas, lice, and mites which live on rats (Schmidt and Roberts 1989). Among the diseases rats may transmit to humans or livestock are murine typhus, leptospirosis, trichinosis, and salmonellosis (food poisoning) (Table 1-1, Timm 1994). Plague is a disease that can be carried by a variety of rodents, but it is more commonly associated with roof rats than with Norway rats (Timm 1994).

Mammal Hazards to Public Safety at Airports. Mammal collisions with aircraft can cause damage to aircraft and pose a risk to safety of passengers and crew (Dolbeer et al. 2012). Animals such as coyotes, skunks and raccoons often venture onto airfields and become a direct threat to planes both landing and taking off. Other mammals which pose hazards to aircraft and public safety include but are not limited to feral dogs, fox, woodchucks, opossums, beaver, muskrat and small rodents (mice and voles). Smaller mammals may not pose a substantial direct risk to aircraft, but they can attract larger predators and scavengers (e.g., raptors, and coyotes) which may be a threat to aircraft.

Between 1990 and 2011 there have been 138 reports of strikes involving aircraft and mammals in Ohio (FAA National Wildlife Strike Database 2013). Coyotes, skunks and raccoons have been recorded in at least 5 aircraft strikes per species. Fox, woodchuck, opossum, rabbits and bats have also been involved in at least one aircraft collision in Ohio. It is estimated that only 20

to 25% of all bird strikes are reported (Conover et al. 1995, Dolbeer et al. 1995, Linnell et al. 1996, Linnell et al. 1999), and it's likely that mammal strikes are also underreported. Consequently, the number of mammal strikes is likely much higher than FAA records indicate.

Other Mammal Hazards to Public Health and Safety. Although incidences of wildlife attacking humans are rare, they do occur. In Ohio, coyotes have become a threat to human health and safety (e.g., attacks on humans and pets) especially in urban and suburban areas. In 2005, a coyote bit a cyclist and approached several other hikers and dog walkers in an aggressive, menacing behavior in a Cleveland Metropark. The suspect coyote was located and euthanized by park officials. The animal tested positive for rabies, becoming the first case of rabies in a coyote in Ohio (WKYC 2005). Recently, in October 2010, a woman in Strongsville, Ohio was bitten by a coyote that was attacking her dog while on the back deck of her home. Subsequent medical attention was needed including preventive rabies shots for the woman (News Channel 5 2010).

1.2.2 Need for Mammal Damage Management to Protect Agricultural Resources

Livestock and dairy production in Ohio contribute substantially to the State's economy. Milk production in Ohio totaled 5.1 million pounds in 2011, valued at an estimated $1.1 billion (NASS 2013). There were an estimated 278,000 milk cows, 292,000 beef cows, 1,810,000 pigs, 139,000 sheep, and 33.1 million chickens in Ohio during 2007 (Ohio Agricultural Statistics 2007).

The ODW and WS receive requests for assistance from Ohio citizens experiencing agricultural damage problems from mammals, including, but not limited to the following: 1) predation on livestock, including poultry, by coyotes and foxes; 2) threat and occurrence of damage to crops and stored feed from mammals such as woodchucks and other rodents; and 3) risk of disease transmission, and 4) other problems. WS may also assist in management efforts involving dogs, cats, and other mammals, coordinated by or with the ODW and USDA/APHIS/Veterinary Services (VS) and/or other Federal and State agencies, to study, monitor and/or control the occurrence and spread of animal diseases to protect livestock and other agricultural resources throughout the state.

Risk of Disease Transmission. Several diseases including pseudorabies, tuberculosis, and chronic wasting disease may be transmitted from wildlife to domestic animals or captive-reared ungulates and *vice versa*. Wildlife Services may work with VS, the ODW, Ohio Department of Agriculture (ODA) or other government agencies to minimize damage from these diseases. As with WS' activities to protect human health and safety, WS could play an important role in the surveillance for diseases transmissible between farmed animals and wildlife including foreign animal diseases. Samples provided by WS can serve to establish important baseline data on the presence or absence of diseases in the state and can help identify areas where cooperators can focus disease management efforts.

State and federal regulations require the lethal removal of all susceptible domestic animals from a farm when certain diseases are detected on the premises (e.g., pseudorabies). In some cases, the applicable state or federal regulatory agency may request WS assistance with the lethal removal of animals or to monitor the surrounding area and lethally remove any animals which may have escaped from the farm (e.g., swine). WS may also be asked to remove escaped ungulates (elk, reindeer, Sika deer, fallow deer, etc.) to reduce risks of disease transmission from captive reared animals to wild populations.

Pseudorabies is a disease of swine that can also affect cattle, horses, dogs, cats, sheep, and goats. The disease is caused by the pseudorabies virus, an extremely contagious herpes virus that causes reproductive problems, including abortion, stillbirths, and even occasional death in breeding and finishing hogs. Pseudorabies is a fatal disease in other domestic animals including cattle, sheep, goats, dogs and cats. Wildlife such as raccoons, skunks, foxes, opossums and small rodents can also be fatally affected (USDA 2010). The United States is one of the world's largest producers of pork and is the second largest exporter of pork. U.S. pork production accounts for about 10 percent of the total world supply. In 2011, there were total $97 billion in total sales pork (National Pork Producers Council 2012). In addition, the pork industry supports more than 550,000 direct and indirect jobs. In 2004, domestic swine in all 50 states had attained Stage V pseudorabies free status. However, pseudorabies is still found in feral swine and these animals serve as a potential source of infection for domestic animals. For example, in 2007, pseudorabies was detected in two domestic swine herds in Wisconsin. All swine at the two properties were killed and swine in the surrounding area were tested and quarantined for several weeks until the end of the testing period. The domestic swine are believed to have contracted the disease from feral swine. Currently, pseudorabies has not been detected in Ohio.

Tuberculosis in livestock is caused by *Mycobacterium bovis*. M. bovis has been reported in a wide variety of mammals including cattle, bison, elk, deer and various zoo animals (Davidson and Nettles 1997). Non ruminants including cats, dogs, coyotes and feral swine can also be infected; however the ability of some of these species to subsequently shed and spread the virus is unclear. In addition to white-tailed deer and cattle, studies in Michigan have identified TB antibodies in elk, coyotes, raccoons, black bears, bobcats, red foxes and Virginia opossums (Schmitt et al. 2002). In Michigan, free-ranging white-tailed deer are believed to be the primary risk of TB infection in cattle. However, research has indicated that raccoons may also be a potential vector for TB in livestock. Raccoons live and thrive in close proximity to livestock and their home ranges are large enough that single individuals may access multiple farms and livestock sources (Vercauteren et al. 2005).

In 1917, the federal government established a bovine TB eradication program. Livestock in most states in the U.S. have been declared free of the disease (USAHA 2004). However, as noted above, TB has been detected in wildlife and dairy herds in Michigan, and, in 2007 was also detected in wild white-tailed deer and dairy herds in Northern Minnesota. Portions of these states have lost their TB free status, at least temporarily,

which has resulted in restrictions on interstate trade and increased testing requirements and serious economic impacts on the livestock industry in the affected area. The presence of TB in wildlife populations can complicate and delay efforts to eradicate TB in livestock (Davidson and Nettles 1997).

Surveillance for TB in wildlife is complicated by the fact that, even in areas believed to have chronic TB infections in deer, only a small portion of the population is infected. For example, in Oscoda and Crawford Counties, Michigan, only 509 of the 10,696 deer (4.8%) tested from 1995-2005 tested positive for TB. Coyotes have been proposed as a potential sentinel species for TB because they may bioaccumulate TB virus when they eat infected deer carcasses and because their relative fidelity to territories and territory size make it possible to predict the area where infected deer may be based on home range size of infected coyotes (Atwood et al. 2007).

Toxoplasmosis. Domestic cats can transmit the protozoan parasite, *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 *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 and free-ranging cats transmitted *T. gondii* to sheep in New Zealand, resulting in abortion in ewes. Dubey et al. (1986) found cats to be a major reservoir of seroprevalence of *Toxoplasma gondii* on swine farms in Ohio. The main sources for infecting cats are thought to be birds and mice.

Chronic Wasting Disease (CWD) is a disease of the nervous system of cervids. The disease is similar to a group of diseases referred to as transmissible spongiform encephalopathies. This group of diseases includes scrapie of sheep, bovine spongiform encephalopathy (Mad Cow Disease) and Creutzfeld-Jakob Disease in humans. The agents that cause these infections are called prions, an abnormal form of a naturally occurring nervous system protein. The disease was first recognized in 1967 at a Colorado wildlife research facility. It has now been diagnosed in wild deer and elk in Colorado and Wyoming, and deer in Nebraska, Illinois, North Dakota, South Dakota, Minnesota, Wisconsin, Kansas, Utah, West Virginia, New York, New Mexico, Texas, Missouri, Maryland, Virginia and Pennsylvania (NWHC 2013). Chronic Wasting Disease has also been detected in farmed deer and elk. Many states require the lethal removal of all captive cervids in herds where one or more animals tests positive for CWD and/or quarantine the herd so that no animals may be added to or removed from the herd. Cervid (deer, elk, reindeer, etc.) farming is legal in Ohio. Annually, ODA's Animal Disease Diagnostics Laboratory is conducting CWD tests on 500+ samples collected from useable road-killed deer (ODW undated). To date, CWD has not been found in captive or wild deer herds in Ohio.

In the event of a CWD outbreak in wild animals, WS would assist in management efforts involving infected and potentially infected animals, coordinated with the ODW, ODA, and/or other Federal and State agencies, to control the occurrence and spread of CWD

throughout the state of Ohio. If warranted, these efforts could include helping the appropriate regulatory agencies depopulate local herds of wild and captive cervids.

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

Disease Risks from Feral Swine. Feral swine are potential reservoirs for 30 viral and bacterial diseases as well as 37 parasites that threaten the health of livestock and humans (Witmer 2004, Hutton et al. 2006, Wyckoff et al. 2009). Of greatest concern is infection of swine production facilities with diseases like swine brucellosis, pseudorabies, and brucellosis. A study (Corn et al, 1986) conducted in Texas found that feral swine do represent a reservoir of diseases transmissible to livestock. Swine harvested in this study tested positive for pseudorabies, brucellosis, and leptospirosis. Other diseases carried by feral swine include hog cholera, tuberculosis, bubonic plague, and anthrax (Beach 1993). A more recent study conducted in Texas also identified antibodies to pseudorabies, brucellosis, and porcine reproductive and respiratory disease virus. Porcupine reproductive and respiratory syndrome is a highly infectious virus, requiring only a few viral particles to initiate infection (Henry 2003). An Oklahoma study (Saliki et al. 1998) found samples also positive for antibodies against porcine parvovirus, swine influenza and porcine reproductive and respiratory syndrome virus. Feral swine act as re-assortment vessels for such viruses as the highly pathogenic H5N1 influenza virus found throughout Europe, Asia, Africa and the Middle East (Hutton et al 2006, Wyckoff et al. 2009). The re-assortment of viruses could lead to new strains of influenza viruses that would become easily transferrable from mammals to humans (Brown 2004, Hutton 2006).

Damage to Crops. Wild and feral mammals can cause damage to a variety of crops and stored feed. For example, aquatic rodents (beaver, muskrats, nutria) may feed on crops including but not limited to corn, soybeans, sorghum, sugar and table beets, alfalfa, wheat, barley, oats, peanuts, various melons, and a variety of vegetables from home gardens and truck farms. Aquatic rodents may also girdle or cut (beaver) fruit and nut trees and trees raised for wood/fiber production (Hill 1982, Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994). In a study of wildlife damage to crops in north-central Indiana, wildlife damage was found in 149 of the 160 fields surveyed. Raccoons and white-tailed deer were responsible for >97% of the damage to corn (87% and 10%, respectively), whereas white-tailed deer (61%) and groundhogs (38%) were responsible for nearly all damage to soybean plants (Humberg et al. 2004).

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

Voles damage orchard trees by gnawing (O'Brien 1994). Trees are badly damaged or the bark is girdled and trees die when feeding by rabbits and voles is severe. Similar damage occurs in nurseries which grow landscape ornamentals and shrubs.

Rats (*Rattus spp*.) and mice cause damage to stored grain through feeding and contamination with droppings. They may damage crops in fields and containers and packaging materials in stored food. They cause structural damage to commodity storage structures and foundations, etc. by burrowing and gnawing.

Predation and Livestock. Red foxes, gray foxes, coyotes, and feral dogs can injure and kill livestock (e.g. sheep, goats, cattle, pigs, horses) and poultry (e.g. chickens, turkeys, geese ducks). Feral swine can also be efficient predators. Calves, kids, lambs, and poultry have been known to become prey of feral swine (West et al. 2009, Stevens 1996, Beach 1993). In 2010, cattle and calf losses from predators in the U.S. totaled nearly 220,000 head and $98.5 million (NASS 2011). Coyotes and dogs accounted for 53.1% and 9.9% of these predator losses, respectively. Farmers and ranchers spent approximately $188.5 million during 2010 on nonlethal predation management methods. Cattle and calves are most vulnerable to predation at calving time and less vulnerable as they get older and larger (Horstman and Gunson 1982). In Ohio, approximately 500 head of cattle and 2,300 calves were reported lost to predators in 2010 (NASS 2011). Total value of cattle and calves lost to predation was $454,000 and $738,000 respectively. Coyotes were responsible for the majority of losses (79%) followed by other predators (13.7%) and vulture (6.8%). The most commonly used nonlethal damage management methods were exclusion fencing (59%), frequent checks (44.4%), guard animals (30.1%), carcass removal (22.6%), and night penning (22.7%).

Sheep and lamb losses from predators in the U.S. totaled 247,200 head (39% of all losses) and $20.5 million during 2009 (NASS 2010). Predators were responsible for 180,000 (32.5%) of goat and kid losses. In Ohio, predation rates are estimated at 12.31% for sheep and lambs, 1.82% for cattle and calves, and 32.17% for goats (NASS 2010). A recent economic study by NWRC for Ohio indicated that over 53,705 animals are lost to producers annually, at a value of $9.65 million (WS 2011). Two factors cause this number to be conservative. First, studies have shown that for every animal lost to predation, five additional animals lost go unreported (WS 2005). This would increase loss estimates to $48.26 million. Second, losses to livestock producers extend beyond the farm to the rest of Ohio's economy. Studies indicate that for every dollar lost in the livestock sector generates a total economic loss in the economy of 1.63 (Jones, 2004). This would indicate that the Ohio economy is losing close to $78.66 million annually from livestock predation (WS 2011).

1.2.3 Need for Mammal Damage Management to Protect Property

Wildlife Services received reports of mammal damage to property by the following species: bats (damage threat), chipmunks (damage threat), raccoons (damage threat, burrowing/digging), coyotes (predation and damage threat), skunks (burrowing/digging, damage threat), woodchucks (burrowing/digging), feral hogs (damage to agricultural crops). The ODW also receives requests from the public in situations where beaver, coyote and other mammals are causing property damage.

Twelve woodchucks have been reported struck by aircraft in Ohio (FAA Strike Database 2011). Another situation on which wildlife damage may affect aesthetic value is woodchucks burrowing into airport grounds and landscaping. From FY2008-2010, over $5,200 was reported to WS in damages associated with woodchucks in Ohio.

Most of the damage caused by beaver is a result of dam building, bank burrowing, tree cutting, obstructing overflow structures and spillways, or flooding. Some cases of beaver damage include roads being flooded, reservoir dams being destroyed by bank den burrows, and train derailments being caused by continued flooding and burrowing (Miller and Yarrow 1994). Housing developments have been threatened by beaver dam flooding. Some small bridges also have been destroyed because of beaver dam-building activity. Miller (1983) estimated that the annual damage by beavers in the United States was $75-$100 million. The estimated value of beaver damage is perhaps greater than that of any other single wildlife species in the U.S. with economic damage estimated to have exceeded $4 billion in the southeastern U.S. over a 40-year period (Arner and Dubose 1980). In some southeastern states, losses from beaver damage have been estimated at $3 million to $5 million dollars annually (Miller and Yarrow 1994), with timber losses as the most common type of damage (Hill 1976). Tracts of bottomland hardwood timber up to several thousand acres in size may be lost to beaver activity (Miller and Yarrow 1994). Beaver often inhabit sites in or adjacent to urban/suburban areas and cut or girdle trees and shrubs in yards, undermine yards and walkways by burrowing, flood homes and other structures, destroy pond and reservoir dams by burrowing into levees, gnaw on boat houses and docks, and cause other damage to private and public property (Wade and Ramsey 1986). Additionally, roads and railroads may be damaged by saturation of the roadbed from beaver flooding or by beaver burrowing into the banks that comprise roadbeds and railroad beds.

Most of the damage caused by muskrats is due to burrowing in dikes, dams, ditches, ponds, and shorelines (Perry 1982, Miller 1994, Linzey 1998). Muskrats dig burrows with underwater entrances along the shoreline which may not be readily evident until serious damage has occurred. When the water level drops, muskrat holes are often expanded to keep pace with the retreating water level. Additionally, when water levels rise muskrats expand the burrows upward. Muskrat burrows can collapse when walked upon by people or animals or crossed over with heavy equipment (i.e. mowers, tractors). Muskrat burrowing activity can seriously weaken man-made dams and levees (Perry 1982). Leaks and failure of water control structures can result in water damage in the areas neighboring the man-made dam or levee and can cause loss of crops due to lack of water in areas where water should be retained (Wade and Ramsey 1986). Restoring recreational fisheries and rebuilding damaged dams and levees can be extremely

costly. Muskrat burrowing in waterfront lawns and yards creates cave-ins and shoreline degradation. Nutria often burrow into styrofoam used for floatation under boat docks, wharves, and houseboats. These burrows can cause structures to become unstable due to unequal buoyancy and possibly sink. Nutria have also been known to burrow under buildings and structures which can lead to uneven settling and foundation failure.

1.2.4 Need for Mammal Damage Management to Protect Natural Resources

Natural resources may be described as those assets belonging to the public and often managed and held in trust by government agencies for citizens. Such resources may be plants or animals, including threatened and endangered species, historic properties, or habitats in general. Examples of natural resources in Ohio 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.

Common damage caused by woodchucks is a result of burrowing and digging. Some cases of woodchuck damage include damaging natural resources by burrowing into earthen dams and dikes used to manage/retain ponds and riparian areas used by other wildlife species, by excessive foraging on riparian and wetland vegetation and cutting/girdling timber, seedlings, and other vegetation in natural areas.

Another example of mammal damage to natural resources is threatened and/or endangered amphibians and birds with low and/or declining productivity and survivorship because of predation by species like raccoons, coyotes, or foxes. In Ohio, raccoon (*Procyon lotor*) damage to nesting species has increased greatly due to an estimated 800% increase in raccoon populations over the past 20 years (Harvey 2009). Balser et al. (1968) recommended that predator damage management programs target the entire predator complex or compensatory predation may occur by a species not under control, a phenomena also observed by Greenwood (1986). Trautman et al. (1974) concluded that a single species predator damage management program showed some promise for enhancing ring-necked pheasant (*Phasianus colchicus)* populations. As part of the Great Lakes Restoration Initiative, WS was requested to implement a meso-predator management program in localized areas determined as critical habitat for the state-listed Threatened Blanding's and/or Spotted turtles (*Emydoidea blandingii* and *Clemmys guttata*).

While beaver ponds can be beneficial to some species of wildlife, beaver activities can also destroy critical habitat types (e.g. free-flowing water, riparian areas, and bird roosting and nesting areas) which are important to other wildlife species including certain species of fish and mussels which may be dependent upon clear, cool and/or fast moving water. Beaver dams may increase sedimentation in streams thereby negatively affecting species that depend on clear water and gravel stream bottoms. For example, the Louisiana WS program has conducted beaver damage management activities to protect the Louisiana pearlshell (*Margaritifera hembeli*), which requires clear, free-flowing water to survive (D. LeBlanc, USDA/APHIS/WS, personal communication). Beaver impacts on trout habitat have been a major concern of the Wisconsin

Department of Natural Resources and the general public since as early as 1950. Patterson (1951) found beaver impoundments in the Peshtigo River Watershed caused significant negative impacts to trout habitat by raising water temperatures, destroying immediate bank cover, changing water and soil conditions, and causing silt accumulations in spawning areas. Studies from other areas also document negative impacts of beaver impoundments on trout habitat (Sayler 1935, Cook 1940, Sprules 1941, Bailey and Stevens 1951). The Wisconsin Department of Natural Resources guidelines for management of trout stream habitat stated that beaver dams are a major source of damage to trout streams (White and Brynildson 1967, Churchill 1980). More recent studies have documented improvements to trout habitat upon removal of beaver dams. Avery (1992) found wild brook trout populations in tributaries to the north branch of the Pemebonwon River in northeastern Wisconsin improved significantly following the removal of beaver dams. Species abundance, species distribution, and total biomass of non-salmonids also increased following the removal of beaver dams (Avery 1992). Increased soil moisture both within and surrounding beaver flooded areas can result in reduced timber growth and mast production and increased bank destabilization. While beneficial in some areas, these habitat modifications can conflict with human land or resource management objectives and can be problems for some plants and animals, including T&E species.

Feral swine can compete with and prey upon native wildlife and severely damage wildlife habitats. Feral swine are omnivorous and feed on a wide variety of items, many of which are staples for native fauna. One of the more important seasonal food resources used by feral swine is wild fruit and nut crops, especially oak mast (Wood and Roark 1980). Oak mast is also an important food source for deer and wild turkey. When feral swine actively compete for mast, resident deer and wild turkey may enter the winter with inadequate fat reserves, thus threatening the viability of these native wildlife species (Beach 1993). Feral swine also predate native wildlife, especially young animals and ground nesting birds, their nestlings and eggs (Beach 1993). The rooting and foraging behavior of feral swine can completely destroy the understory in forests and make trees less stable during windstorms. Their wallowing and foraging can significantly damage wetlands, which may be important for threatened and endangered (T&E), and sensitive species such as fish.

When muskrats become over-populated, generally an “eat-out” occurs and the feeding area is ruined for a number of years (O’Neil 1949). An “eat-out” occurs when vegetation and soil binding roots are consumed which results in loss of vegetation, food, and cover for muskrats and other wildlife. Marsh damage from muskrats is inevitable when areas heavily populated by muskrats are under-trapped (Lynch et al. 1947). “Eat-outs” are beneficial to some fish eating bird species because they reduce cover for prey creating easier access to food sources. “Eat-outs” are also beneficial by increasing the amount of loafing areas for shorebirds and some species of ducks; however, “eat-outs” also result in stagnate water which predisposes the same birds to diseases (Lynch et al. 1947) like West Nile Virus, St. Louis encephalitis, LaCrosse encephalitis, and Western Equine encephalitis.

White Nose Syndrome (WNS) is associated with a newly identified fungus called *Geomyces destructans*. The disease got its name from how the fungus appears and grows into white tufts on the muzzles of infected bats. Biologists believe the main method of transfer of the disease is

bat-to-bat transmission. It's also believed that humans can transport the fungal spores on their shoes, clothes, and other gear from contaminated sites to new sites (ODW 2011).

Some of the species listed as threatened or endangered under the Endangered Species Act of 1973 and as specified by the Ohio Division of Wildlife are preyed upon or otherwise adversely affected by certain mammal species. Piping plovers (*Charadrius melodus*), Kirtland's warbler (*Dendroica kirtlandii*), Allegheny woodrat (*Neotoma magister*), snowshoe hare (*Lepus americanus*), Blanding's turtle (*Emydoidea blandingii*), and spotted turtles (*Clemmys guttata*) can be negatively affected by raccoons, opossums, striped skunks, and other mammals that prey on birds and amphibians, eat eggs, and cause disturbances on nesting sites. Meso-predator damage to nesting turtles is well documented (Engerman et al. 2010). Congdon et al. (1983) found raccoons to be the most common predator of Blanding's turtle nests in Michigan, where only 24 of 73 monitored nests were successful. In other years, predation of nests in some monitored populations reached 100% (Congdon et al. 1987).

Massey (1971) and Massey and Atwood (1979) found that predators can prevent least terns from nesting or cause them to abandon previously occupied sites. In another study, mammal predators were found to have significantly impacted the nesting success of least terns on sandbars and sandpits (Kirsch 1996). Skunks (Massey and Atwood 1979), red foxes (Minsky 1980), coyotes (Grover and Knopf 1982), and raccoons (Gore and Kinnison 1991) are common predators of least terns. During one two-year study, coyotes destroyed 25.0-38.5% of all interior least tern nests (Grover 1979). In Massachusetts, predators destroyed 52-81% of all active piping plover nests from 1985-1987 (MacIvor et al. 1990). Red foxes accounted for 71-100% of the nests destroyed by predators at the site.

1.3 DECISION TO BE MADE

Wildlife Services is the lead agency in the preparation of this EA. This proposal would require the participation of other agencies that have management authority and expertise related to this project (cooperating and consulting agencies). The USDA Forest Service has responsibility to manage the resources of federal lands for multiple uses including timber production, recreation and wildlife habitat, while recognizing the state's authority to manage wildlife populations. The USFS was a cooperating agency in the preparation of this EA. The ODW, as a consulting agency, provides for the control, management, restoration, conservation and regulation of birds, fish, game, forestry and all wildlife resources of the state.

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

- Should MDM as currently implemented by the WS program be continued in Ohio?
- If not, how can WS best respond to the need to reduce mammal damage in Ohio?
- What are the potential impacts of the alternatives for addressing mammal damage?

- Do the alternatives have significant impacts meriting an Environmental Impact Statement (EIS)?

1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

1.4.1 Actions Analyzed

This EA evaluates mammal damage management by WS to protect: 1) property; 2) agricultural resources; 3) natural resources; and 4) public health and safety in Ohio wherever such management is requested from the WS program. Protection of other resources or other program activities would be addressed in other NEPA analysis, as appropriate.

1.4.2 Native American Lands and Tribes

At present, there are no federally-recognized tribes in Ohio. In the event that Native American tribes are federally recognized in the state, WS would not conduct MDM activities on tribal lands without the consent of the affected tribe(s). If WS enters into an agreement with a tribe for MDM, this EA would be reviewed and supplemented, if appropriate, to insure compliance with NEPA. MOUs, agreements and NEPA documentation would be prepared as appropriate before conducting MDM on tribal lands.

1.4.3 Period for which this EA is Valid

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

1.4.4 Site Specificity

This EA analyzes the potential impacts of MDM and addresses WS' activities on all public or private lands in Ohio currently addressed in MOUs, Cooperative Service Agreements and similar agreements with public land management agencies. It also addresses the impacts of MDM on areas where additional agreements may be signed in the future. Because the proposed 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. This EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program.

Planning for the management of mammal damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will 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, insurance companies, etc. Although some of the sites where mammal damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply wherever mammal damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Ohio (Chapter 3). The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within the State of Ohio. In this way, WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.4.5 Public Involvement

Issues related to the proposed action were initially identified and developed by WS based on experience with similar programs in other parts of the country and existing projects in Ohio. As part of WS' Environmental Analysis process, and as required by the Council on Environmental Quality (CEQ 1981), APHIS-NEPA implementing regulations and WS' NEPA implementation procedures published in the Federal Register March 21, 2007 (Vol. 72, No. 54: 13237-13238). This document and its Decision will be made available to the public through Notices of Availability (NOA) published in the *Columbus Dispatch*, through direct mailings of NOA to parties that have specifically requested to be notified, and through the WS website (http://www.aphis.usda.gov/wildlife_damage/nepa.shtml). Comments on the EA and Supplement will be reviewed for new and substantive issues and to determine whether the Supplement and EA should be revisited and, if appropriate, revised prior to issuance of a final Decision.

1.5 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

Environmental Assessment: Management of coyote, red fox, feral dog, wolf-hybrid, and exotic carnivore predation on livestock in the State of Ohio. WS completed an EA that covered canine damage management and livestock predation in the state of Ohio in 2001 (USDA 2001). Once the EA on mammal damage management in Ohio is completed, it will supersede the mammal management sections of the EA on wildlife damage management of canines.

Environmental Assessment: White-tailed Deer Damage Management in Ohio. WS completed an EA that covered white-tailed deer damage management in the state of Ohio in 2009 (USDA 2009a). Management of damage by and conflicts with white-tailed deer is not included in this EA.

Environmental Assessment: Wildlife Damage Management at Airports in Ohio. WS completed an EA that covered wildlife damage management at airports in the state of Ohio in 2007 (USDA 2007). Mammal hazard management at airports has been included in the EA on mammal damage management in Ohio. Once the EA on mammal damage management in Ohio

is completed, it will supersede the mammal management sections of the EA on wildlife damage management at airports in Ohio.

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

1.6 AUTHORITY AND COMPLIANCE

1.6.1 Wildlife Services

WS is the Federal program authorized by law to reduce damage caused by wildlife (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)). The mission of the USDA/APHIS/WS program is to provide federal leadership in managing conflicts with wildlife. Wildlife Services' mission, developed through its strategic planning process (USDA 1999), is: 1) "to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety." WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can cause damage to agriculture and property, pose risks to human health and safety, and affect industrial and natural resources. WS conducts programs of research, technical assistance and applied management to resolve problems that occur when human activity and wildlife conflict.

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

1.6.2 USDA, Forest Service

The Forest Service has the responsibility to manage the resources of federal lands for multiple uses including timber production, recreation and wildlife habitat, while recognizing the state's authority to manage wildlife populations. The Forest Service recognizes the importance of reducing wildlife damage on lands and resources under their jurisdiction, as integrated with their multiple use responsibilities. Occasionally, wildlife damage management actions may be taken on National Forest Service lands to protect resources on adjacent properties. For these reasons, the Forest Service has entered into a national MOU with WS to facilitate a cooperative relationship. Copies of the MOU are available by contacting the WS State Director's Office at 6929 Americana Parkway Reynoldsburg, OH 43068.

Wayne National Forest
Wildlife disease surveillance issues are particularly relevant for the management of the Ironton district concerning feral swine. WS partners with the Forest Service to access property where they can trap and collect biological samples from feral swine for disease surveillance. In addition, raccoon density studies are conducted yearly on Wayne National Forest in the Athens district to assess raccoon densities and monitor for zoonotic diseases such as rabies.

1.6.3 Ohio Department of Natural Resources Legislative Authority

The Ohio Department of Natural Resources, Division of Wildlife, is the managing and regulatory agency responsible for wildlife listed in Chapter 1531 and 1533 of the Ohio Revised Code (ORC).
The primary statutory authorities include the protection, preservation, propagation, and management of wild animals in Ohio (ORC §1531.04).

1.6.4 Ohio Department of Agriculture's Bureau of Animal Health

Ohio Department of Agriculture's Bureau of Animal Health and Welfare is responsible for detection and eradication of certain animal diseases. State veterinarians perform epidemiological investigations, develop plans to eradicate disease in infected herds, and monitor and test animals. Animal health investigators assist state field veterinarians with livestock testing, collect milk samples from dairy herds, test poultry for disease and ensure livestock owners comply with testing requirements. These officials also inspect livestock markets for proper sanitation, monitor livestock identification and ensure animals are transported properly. The ODA licenses individuals and businesses, such as auction markets, livestock dealers, feeder swine dealers and slaughter buyers, who purchase and sell livestock for a fee or assume ownership of livestock to resell at a profit. Licensing allows the department to ensure compliance with animal health laws and strengthens the livestock industry by taking action when businesses operate illegally.

1.6.5 Compliance with Federal Laws

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

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

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

Endangered Species Act (ESA). It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act (Sec. 2(c)). 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.

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. Wildlife Services has consulted with the ODW 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 ODA 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. 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. 3801-3862), 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. Wildlife Services 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.

1.6.6 Ohio Wildlife Laws, Regulations and Policies Regarding Mammal Damage Management

Ohio Wildlife Laws. Several state laws and regulations pertain to WS' wildlife damage management actions (Appendices D). WS complies with these laws and regulations, and consults and cooperates with other agencies as appropriate.

Ohio Pesticide Laws. The use of pesticides in Ohio is conducted pursuant to the Ohio Pesticide Law (Ohio Administrative Code 901:5-11-01 paragraph (N)(10)). Use of products such as those intended to kill rodents and larger mammals is regulated by the ODA.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues relevant to mammal damage management in Ohio, including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues used to develop SOPs, and issues not considered in detail in Chapter 4. Review of impacts on the affected environment is included, in part, in this chapter and in the discussion of the environmental impacts in Chapter 4.

2.1 AFFECTED ENVIRONMENT

The proposed action could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where mammals burrow, feed, or otherwise occur. Examples of areas where mammal damage management activities could be conducted are, but are not necessarily limited to: agricultural fields, orchards, farmyards, dairies, ranches, livestock operations, waste handling facilities, industrial sites, natural areas, government properties and facilities, private homes and properties, corporate properties, schools, hospitals, parks and recreation areas, swimming lakes, communally-owned homeowner/property owner association properties, wildlife refuges, wildlife management areas, lake beaches, ponds, rivers, and inlets, earthen dams and levees, airports and surrounding areas.

2.2 ISSUES ANALYZED IN DETAIL

The following issues have been identified as areas of concern requiring detailed consideration for each management alternative proposed in this EA (Chapter 4):

- Effects on target mammal species
- Effects on other wildlife species, including Threatened and Endangered species
- Effects on human health and safety
- Impacts to stakeholders, including aesthetics
- Humaneness and animal welfare concerns of methods used
- Effects on wetlands

2.2.1 Effects on Target Mammal Species

A common issue is whether damage management actions would adversely affect the populations of target mammal species. Methods that would be available under the alternatives to resolve damage or threats are considered either non-lethal methods or lethal methods. Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage, which reduces the presence of those species at the site, and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove a mammal or those mammals responsible for causing damage or posing threats to human safety. 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 or dispersed from an area using non-lethal methods under the alternatives would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

The analysis for magnitude of impact on populations from the use of lethal methods would be based on a measure of the number of animals killed in relation to their abundance. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations would be based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations would be based on population trends and harvest trend data, when available. Take would be monitored by comparing the number of animals killed with overall populations or trends in populations to assure the magnitude of take was maintained below the level that would cause significant adverse effects to the viability of a native species population. Under the alternatives where lethal methods could be employed or recommended, the lethal take (killing) of mammals would only occur at the request of a cooperator seeking assistance and only after the take of those species identified as targets had been permitted by the ODW, when required.

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

Wildlife Services, members of the wildlife management profession, as well as the public, are concerned about whether the proposed action or any of the alternatives might result in adverse impacts on non-target wildlife species, especially state and federally listed T&E species.

Threatened and Endangered species lists for the United States Fish and Wildlife Service (USFWS) and State of Ohio were reviewed to identify potential effects on federal and state listed T&E species. WS has consulted with the USFWS and ODW regarding potential risks to T&E species from the proposed MDM methods. Special protective measures and Standard Operating Procedures have been incorporated as needed to minimize or eliminate risks to T&E species from WS' actions. None of the actions proposed in this EA would jeopardize state or federal populations of T&E species.

Some members of the public are concerned that the use of registered toxicants and drugs to reduce mammal damage would have adverse impacts on other wildlife species, including T&E

species. Wildlife Services only uses pesticides that have been approved by the EPA and the ODA and applies, stores and disposes of these products in accordance with the label directions. The toxicants proposed for use and recommendation by WS are gas cartridges, zinc phosphide, 1080 livestock protection collars, sodium cyanide (M-44's), carbon dioxide (CO_2), anticoagulant rodenticides, and registered drugs for animal immobilization and euthanasia (Appendix B). WS may also provide technical assistance on the use of repellents. Appendix B contains detailed descriptions of these products. An evaluation of potential impacts on non-target species from the use of toxicants is provided for each alternative (Chapter 4).

2.2.3 Effects on Human Health and Safety

Some individuals may have concerns that chemicals used for wildlife damage management may have adverse effects on people from direct exposure to chemicals or exposure to animals that have died as a result of chemical use. Use of these products is regulated by the EPA, ODW, and by WS Directives (Directives 2.401 - Pesticide Use, 2.405 - Pesticide Registrations and Permits, 2.415 M-44 Use and Restrictions, 4.20 - Livestock Protection Collars, 2.430 - Chemical Immobilization and Euthanizing Agents). Chemical pesticides have undergone considerable environmental review through EPA and State registration processes, which means they have been found to present no unreasonable risk to the environment or human health and safety when used according to label directions. WS personnel who apply pesticides are certified pesticide applicators and apply pesticides according to label instructions.

Wildlife Services also uses Food and Drug Administration (FDA) registered chemicals for animal immobilization and euthanasia. Some individuals are concerned that the drugs used in animal capture, handling, and euthanasia may cause adverse health effects in humans that hunt and eat the species involved.

Some people may be concerned that WS' use of firearms, traps, snares and pyrotechnic scaring devices could cause injuries to people. Wildlife Services personnel occasionally use traps, snares and firearms to remove mammals that are associated with damage. There is some potential fire hazard to agricultural sites and private property from pyrotechnic use, although the risks are very low.

Firearm use is a very sensitive issue and a concern because of public fears regarding the risks associated with unsafe firearms use and the threat of misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within three months of their appointment and a refresher course at least once every three years thereafter (WS Directive 2.615). Wildlife Services employees who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

2.2.4 Impacts to Stakeholders, Including Aesthetics

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

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

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception, and today a large percentage of households have pets. Some people may consider individual wild animals and birds as pets or exhibit affection toward these animals. Others may experience anxiety or fear when wild animals come into close proximity to their homes and families. It is not surprising that the public reaction to wildlife damage management techniques is mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife.

Many people directly affected by problems and threats to public health or safety associated with mammals may insist upon removal of the animal(s) from the property or public location when they cause damage. Some members of the public believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to public health or safety. Others, directly affected by the specific wildlife problem, may not agree that there is a problem. They may perceive that the issue at hand is normal animal behavior and a consequence of living in proximity to nature and should be tolerated. Similarly, individuals not directly affected by the harm or damage caused by wildlife may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Individuals totally opposed to mammal damage

management want WS to teach tolerance for damage and threats to public health or safety, and that wildlife should never be killed. Some people would strongly oppose removal of mammals regardless of the amount and type of damage. Reasons for opposing removal of wildlife vary but may include affectionate bonds with individual animals, loss of aesthetic or recreational interest (e.g., wildlife watching or hunting), or a moral conviction that humans do not have the right to take the life of an animal. For example, advocates of the Animal Rights philosophy believe that animals are entitled to the same rights and protections as humans, and that if any action is unacceptable treatment for a human, it is unacceptable treatment for an animal.

2.2.5 Humaneness and Animal Welfare Concerns of Methods Used

Humaneness, in part, is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important and very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if *"* . . . *the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."* Suffering is described as a *"* . . . *highly unpleasant emotional response usually associated with pain and distress*. However, suffering *"* . . . *can occur without pain* . . . , and *"* . . . *pain can occur without suffering* . . . (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for *"* . . . *little or no suffering where death comes immediately* . . . (CDFG 1991), such as shooting.

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

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

The decision-making process involves tradeoffs between the above aspects of pain and humaneness. Humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. One challenge with coping with this issue is how to achieve the least amount of animal suffering within the constraints of current technology and resources. Ohio WS personnel are experienced and professional in their use of management methods so that they are used in a humane manner

within the constraints of current technology and resources.

Analysis of this issue must consider not only the welfare of the animals captured, but also the welfare of humans, livestock and some T&E species if damage management methods are not used. For example, some individuals may perceive techniques used to remove a predator that is killing or injuring pets or livestock as inhumane, while others may believe it is equally or more inhumane to permit pets and livestock that depend upon humans for protection to be injured or killed by predators. Wildlife Services is aware that techniques like snares and traps are controversial, but also believes that these activities are being conducted as humanely and responsibly as practical. Wildlife Services and the National Wildlife Research Center are striving to bring additional non-lethal damage management alternatives into practical use and to improve the selectivity and humaneness of management devices. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations when non-lethal damage management methods are not practical or effective. Wildlife Services supports the development of humane, selective, and effective damage management techniques, and would continue to incorporate advances into program activities.

Some people are concerned about the humaneness of drowning beaver, nutria, and muskrats while restrained by leg-hold traps. Considerable debate and disagreement among animal activists, veterinarians, wildlife professionals, fur trappers, and nuisance wildlife specialists is apparent. Debate centers around an uncertainty as to whether drowning animals are rendered unconscious by high levels of carbon dioxide (CO_2) and thus insensitive to distress and pain (Ludders et al. 1999). The AVMA identifies drowning as an unacceptable method of euthanasia (Beaver et al. 2001), but provides no details on the reasons for this decision. Ludders et al. (1999) concluded drowning is not euthanasia based on the animals not dying from CO_2 narcosis, because CO_2 narcosis does not occur until 95 millimeters of mercury in arterial blood is exceeded. Ludders et al. (1999) showed death during drowning is from hypoxia and anoxia, and thus animals experience hypoxemia. Ludders et al. (1999) also concluded that animals that drown are distressed because of stress related hormones, therefore, drowning is not euthanasia.

CO_2 causes death in animals by hypoxemia (inadequate oxygenation of the blood) and some animals (i.e. cats, rabbits, and swine) are distressed before death (Beaver et al. 2001). Even though these animals are distressed, the AVMA states that CO_2, when used properly, is an acceptable form of euthanasia (Beaver et al. 2001). Thus, the AVMA does not preclude distress or pain in euthanasia. In fact, the AVMA supports inducing hypoxemia related distress when necessary to reduce total distress, because reducing total distress is a more humane death.

Death by drowning in the classical sense is caused by inhalation of fluid into the lungs and is referred to as wet drowning (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that all submerged beaver do not die from wet drowning, but die of oxygen deprivation after a period of CO_2 induced stupor (narcosis). According to Gilbert and Gofton (1982) and Noonan (1998), the AVMA accepts CO_2 as a suitable form of euthanasia. However, the 2000 AVMA report on Euthanasia only considers use of CO_2 acceptable or provisionally acceptable if administered under tightly controlled conditions including requiring that the only

acceptable source of CO_2 is bottled gas because of the amount of CO_2 administered can be carefully controlled (Beaver et al. 2001). Gilbert and Gofton (1982) also reported that after beaver were trapped and entered the water struggling occurred for two to five minutes followed by a period of reflexive responses. Andrews et al. (1993) reports that with some techniques that induce hypoxia, some animals have reflex motor activity followed by unconsciousness that is not perceived by the animal. Gilbert and Gofton (1982) stated it is unknown how much conscious control actually existed at this stage and oxygen deprivation may have removed much of the sensory perception by 5-7 minutes post submersion. However, Gilbert and Gofton (1982) have been criticized because levels of CO_2 in the blood were not reported (Ludders et al. 1999) and there was insufficient evidence that the beaver in their study were under a state of CO_2 narcosis when they died. Adding to the controversy, Clausen and Ersland (1970) did measure CO_2 in the blood for submersed restrained beaver, yet none of the beaver in the study died. Therefore, Clausen and Ersland (1970) could not determine the exact cause of death. However, Clausen and Ersland (1970) were able to demonstrate that CO_2 increased in arterial blood while beaver were submersed and that CO_2 was retained in tissues. While Clausen and Ersland (1970) did measure the amounts of CO_2 in the blood of submersed beaver they did not attempt to measure the desensitizing effect of CO_2 buildup in beaver.

When beaver are captured using leg-hold traps with intent to drown, beaver are exhibiting a flight response. Gracely and Sternberg (1999) reported that there is stress-induced reductions in sensitivity to pain during fight and flight responses. Environmental stressors that animals experience during flight or fight activate the similar stress-induced reductions in sensitivity to pain as capture in traps (Gracely and Sternberg 1999).

Use of drowning trap sets has been a traditional wildlife management technique in trapping aquatic mammals such as beaver, nutria, and muskrats. Trapper education manuals and other wildlife damage management manuals written by wildlife biologists recommend drowning sets for foothold traps set for beaver (Howard et al. 1980, Randolph 1988, Bromley et al. 1994, Dolbeer et al. 1994, Miller and Yarrow 1994). Drowning trap sets are considered by some to be the most appropriate and effective method available to capture beaver, nutria, and muskrats in some situations. These people generally perceive the relatively short time to death from drowning (minutes) to be preferable to the potential stress and distress an animal might experience while in a live capture device (hours) until eventually euthanized. Animals in live capture devices are vulnerable to being harassed, killed or injured by humans, dogs, or other wildlife (Miller and Yarrow 1994). Drowning sets make the captured animal and trap less visible and prevent injury (i.e., bites and scratches) to people who may otherwise approach a restrained animal. Some sites may be unsuitable for body-gripping traps or snares because of unstable banks, deep water, or substrate conditions. However, these sites may be suitable for foothold traps.

Given the relatively short time period of a drowning event compared to being held in a live capture device, possible analgesic effect of CO_2 buildup to beaver, acceptance of catching and drowning muskrats approved by International Humane Trapping Standards, the conclusion has been drawn that drowning, though rarely used by WS, will continue to be included as an available method in alternatives that allow for lethal methods of MDM. Some people will

disagree and remain un-swayed.

2.2.6 Effects on Wetlands

Some people are concerned about the effects of the alternatives on wetland ecosystems, specifically that the removal of beaver or breaching/removing beaver dams from an area will result in the loss of wetland habitat and the plant and animal species included in those habitats. Beaver build dams primarily in smaller rivers (intermittent and perennial streams and creeks) with dams consisting of mud, sticks, and other vegetative materials. Dams obstruct the normal flow of water and typically change the pre-existing wetland hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment. 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. If a beaver dam is not breached/removed and water levels remain constant, hydric soils and hydrophytic vegetation eventually form. This process can take anywhere from several months to years depending on pre-existing conditions. Hydric soils are those soils that are saturated, flooded, or submerged long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much faster in areas where wetlands have previously existed. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. If these conditions are met, a wetland can develop that would have different wildlife habitat values than an area recently impounded by beaver dam activity.

Some species will benefit from the addition of a beaver dam, while others will diminish. For example, some species of darters listed as federally endangered require fast moving waters over gravel or cobble beds which beaver dams can eliminate, thus reducing the habitat's value for these species. In general, it has been found that terrestrial wildlife habitat values decline around bottomland beaver impoundments in the southern US, because hardwood trees are killed from flooding and mast production declines. On the other hand, beaver dams can potentially be beneficial to species of wildlife such as river otters, Neotropical birds, and waterfowl.

The United States Army Corps of Engineers (USACE) established criteria for dam breaching/removal activities to minimize any impacts to the water course basin, adjacent riparian areas, or surrounding vegetation. The intent of most dam breaching/removal is not to drain established wetlands. With few exceptions, requests from public and private individuals and entities involve dam breaching/removal to return an area back to its preexisting condition. Hydric soils and wetland conditions usually take many years to develop, often greater than five years as recognized by Swampbuster provisions. Most beaver dam removal by WS is either exempt from regulation under Section 404 of the Clean Water Act as stated in 33 CFR Part 323 or may be authorized under the USACE Nationwide Permit System in 33 CFR part 330. However, breaching/removal of some beaver dams can involve certain portions of Section 404 to require landowners to obtain permits from the USACE.

2.3 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

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

Funding for WS comes from a variety of sources in addition to federal appropriations for the WS program. In Ohio, these sources could include but are not limited to federal, state, county and municipal governments/agencies, private organizations, corporations and individuals, homeowner/property owner associations, and others, under Cooperative Service Agreements and/or other contract documents and processes (http://www.aphis.usda.gov/wildlife_damage/state_report_pdfs/2010/36-ohio_report.pdf). Federal, state, and local officials have decided that wildlife damage management should be conducted by appropriating funds. Wildlife Services was established by Congress as the agency responsible for providing wildlife damage management to the people of the United States. Wildlife damage management is an appropriate sphere of activity for government programs, since aspects of wildlife damage management are a government responsibility and authorized and directed by law.

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

Private nuisance wildlife control agents could be contacted to reduce mammal damage for property owners or property owners could attempt to reduce their own damage problems. Some property owners would prefer to use a private nuisance wildlife control agent because the nuisance wildlife agent is located in closer proximity and thus could provide the service at less expense, or because they prefer to use a private business rather than a government agency. However, some property owners would prefer to request a government agency for assistance. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues and reduced administrative burden. The relationship between WS and private industry is addressed in WS directive 3.1.1 (http://www.aphis.usda.gov/wildlife_damage/directives/3101.pdf).

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

Some individuals might question whether preparing an EA for an area the size of the State of Ohio would meet the NEPA requirements for site specificity. If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a better analysis than multiple EAs covering smaller zones. In addition, the WS program in Ohio only conducts MDM on a relatively small area of the State where damage is occurring or likely to occur.

2.3.4 Effectiveness of Mammal Damage Management Methods

A concern among members of the public is whether the methods of reducing mammal damage will be effective in reducing or alleviating damage and conflicts. The effectiveness of each method or methods can be defined in terms of decreased potential for health risks, decreased human safety hazards, reduced property damage, reduced agricultural damage, and reduced natural resource damage. In terms of the effectiveness of a specific method or group of methods, this would not only be based on the specific method used, but more importantly upon the skills and abilities of the person implementing the control methods and the ability of that person to determine the appropriate course of action to take. It would be expected that the more experience a person has in addressing mammal damage conflicts and implementing control methods the more likely they would be in successfully reducing damage to acceptable levels. The WS technical assistance program provides information to assist persons in implementing their own MDM program, but at times the person receiving WS technical assistance may not have the skill or ability to implement the MDM methods recommended by WS. Therefore, it is more likely that a specific MDM method or group of methods would be effective in reducing damage to acceptable levels when WS professional wildlife damage assistance is provided than that would occur when the inexperienced person attempts to conduct MDM activities.

2.3.5 Livestock Losses Are a Tax "Write-Off"

Some people believe that livestock producers receive double benefits because producers have a partially tax funded program to resolve predation problems while they also receive deductions for livestock lost as a business expense on tax returns. However, this notion is incorrect because the Internal Revenue Service tax code (Internal Revenue Code, Section 1245, 1281) does not allow for livestock losses to be "written off" if the killed livestock was produced on the owner's property. Most predation occurs on young livestock (lambs, kids, and calves) born on the producer's property and are not "purchased" animals. Similarly, many ewes, nannies, and cows added as breeding stock replacements to herds were born and raised on the farm and cannot be "written off" since they were not purchased. These factors limit the ability of livestock producers to recover financial losses.

2.3.6 Livestock Losses and Other Wildlife Damage Should Be an Accepted Cost of Doing Business

Wildlife Services is aware of concerns that federal MDM should not be allowed until economic losses reach an identified threshold of loss or become unacceptable. Although some wildlife damage can be expected and are tolerated, WS has the legal direction to respond to requests for wildlife damage management, and it is WS policy to aid each requester to minimize losses. Wildlife Services uses the Decision Model discussed in Chapter 3 to determine an appropriate strategy for each damage situation.

2.3.7 Global Climate Change/Greenhouse Gas Emissions

The WS program activities that may result from the alternatives would have a negligible effect

on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of the proposed action. The proposed action would meet requirements of applicable federal laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

2.3.8 Effects on Legal Hunting and Trapping

Some people may be concerned that WS predator management activities would affect regulated hunting and trapping by reducing local wild canid populations, and that lethal and non-lethal damage management methods may interfere with legal regulated hunting and trapping. WS annual take of coyotes and fox by lethal control methods would be very minimal compared to the annual take by licensed hunters in Ohio (See Section 4.1.1). WS activities may result in reduced coyote or fox densities on project area properties and on adjacent properties, hence slightly reducing the number of coyotes and fox that may otherwise be available to local licensed hunters. Coyote and fox densities on other properties outside the project area would likely not be affected, thus providing ample opportunities for hunters and trappers to harvest these animals.

2.3.9 Lethal Methods May Increase Predation and the Coyote Population through Compensatory Reproduction

Mortality in coyote populations can range from 19%-100%, with 40%-60% mortality most common (USDI 1979). Several studies of coyote survival rates, which include calculations based on the age distribution of coyote populations, show typical annual survival rates of only 45% to 65% for adult coyotes. High mortality rates have also been shown in four telemetry studies involving 437 coyotes that were older than 5 months of age; 47% of the marked animals are known to have died (USDI 1979). Mortality rates of "unexploited" coyote populations were reported to be between 38%-56%. Thus, most natural coyote populations are not stable (USDI 1979). In studies where reported coyote mortality was investigated, only 14 of 326 recorded mortalities were due to WS activities (USDI 1979).

Dispersal of "surplus" young coyotes is the main factor that keeps coyote populations distributed throughout their habitat (Knowlton 1972, Harrison et al. 1991, Harrison 1992). Such dispersal of subdominant animals removes surplus animals from higher density areas and repopulates areas where artificial reductions have occurred. Studies (Connolly et al. 1976, Gese and Grothe 1995, Gese 1999) which investigated the predatory behavior of coyotes, determined that the more dominant alpha animals (adult breeding pairs) were the ones that initiated and killed most of the prey items. Thus, it appears the above concern is unfounded because the removal of local territorial (dominant, breeding adult) coyotes actually removes the individuals that are most likely to kill livestock and generally results in the immigration of subdominant coyotes that are less likely to prey on livestock.

Coyotes in areas of lower population densities may reproduce at an earlier age and have more offspring per litter; however, these same populations generally sustain higher mortality rates (Connolly and Longhurst 1975). Therefore, the overall population of the area does not change. The number of breeding coyotes does not substantially increase without exploitation and

individual coyote territories produce one litter per year independent of the population being exploited or unexploited (Connolly and Longhurst 1975). Connolly and Longhurst (1975) demonstrated that coyote populations in exploited and unexploited populations do not increase at significantly different rates and that an area will only support a population to its carrying capacity.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

This chapter consists of six parts: 1) description of alternatives considered and analyzed in detail, 2) mammal damage management approaches used by WS, 3) specific mammal damage management methods that could be authorized for use or recommended by WS, 4) methodologies recommended but deemed impractical, ineffective, or unsafe at the present time, 5) a description of alternatives considered, but eliminated from detailed analysis, and 6) standard operating procedures. Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992).

Four alternatives were recognized, developed, and analyzed in detail. An additional three alternatives were considered, but not analyzed in detail. The four alternatives analyzed in detail are:

- Alternative 1: Technical Assistance Only
- Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)
- Alternative 3: Non-lethal Mammal Damage Management Only By WS
- Alternative 4: No Federal WS Mammal Damage Management

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 Alternative 1: Technical Assistance Only

This alternative would not allow for WS operational MDM in Ohio. WS would only provide technical assistance (advice) and make recommendations when requested. Currently, ODW only provides direct MDM assistance in limited situations, but does provide technical assistance and issues permits for MDM activities as appropriate. Producers, property owners, agency personnel, or others could conduct MDM using any legal lethal or non-lethal method. Individuals might choose to implement WS recommendations, implement other methods not recommended by WS, use contractual services of private businesses, or take no action. Appendix B describes a number of methods that could be employed by private individuals or other agencies after receiving technical assistance advice under this alternative.

3.1.2 Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

The No Action Alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable alternative that could be selected and serves as a baseline for comparison with the other alternatives. The No Action Alternative, as defined here, is consistent with guidance from the CEQ (CEQ 1981). In this guidance, the No Action Alternative for situations where there is an ongoing management program may be interpreted as "no change" from current management direction or level of management intensity.

WS proposes to continue the current damage management program that responds to mammal damage in Ohio. WS involvement in mammal damage management is closely coordinated with the ODW, and WS take of mammals is authorized through permits and/or other authorities granted by ODW. An IWDM approach would be implemented to reduce mammal damage to property, agricultural resources, and natural resources, and to reduce mammal impacts on human/public health and safety. Damage management would be conducted on public and private property when the resource owner (property owner) or manager requests assistance. The IWDM strategy would encompass the use and recommendation of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate non-lethal techniques like physical exclusion, habitat modification or harassment would be recommended and utilized to reduce damage. In other situations, mammals would be removed as humanely as possible using shooting, trapping, registered pesticides and other products. Also, aerial gunning can be used as a tool to remove mammals in locations where trapping or other methods may not be effective. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy.

3.1.3 Alternative 3: Non-lethal Mammal Damage Management Only by WS

This alternative would require WS to only use and recommend non-lethal methods to resolve mammal damage problems. Information on lethal MDM methods would still be available to producers and property owners through other sources such as ODW, USDA Agricultural Extension Service offices, universities, or pest control organizations. Requests for information regarding lethal management approaches would be referred to these entities. Currently, ODW only provides direct MDM assistance in limited situations, but does provide technical assistance and issues permits for MDM activities as appropriate. Individuals might choose to implement WS non-lethal recommendations, implement lethal methods or other methods not recommended by WS, obtain WS direct assistance with non-lethal MDM, use contractual services of private

businesses, or take no action. Persons receiving WS' non-lethal technical and direct damage management assistance could still resort to lethal methods that were available to them.

3.1.4 Alternative 4: No Federal WS Mammal Damage Management

This alternative would eliminate WS involvement in MDM in Ohio. WS would not provide direct technical or control assistance and requesters of WS' assistance would have to conduct their own MDM without WS input. Information on MDM methods would still be available to producers and property owners through other sources such as ODW, USDA Agricultural Extension Service offices, universities, or pest control organizations. Currently, ODW only provides direct MDM assistance in limited situations, but does provide technical assistance and issues permits for MDM activities as appropriate. Requests for information would be referred to these entities. Individuals might choose to conduct MDM themselves, use contractual services of private businesses, or take no action.

3.2 Mammal Damage Management Strategies Used by WS

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2 and 3 described above. Alternative 4 would terminate both technical assistance and operational MDM by WS. Appendix B is a more thorough description of the methods that could be used or recommended by WS.

3.2.1 Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in the most cost-effective[2] manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2 The IWDM Strategies Employed by WS

Technical Assistance Recommendations
Technical assistance as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods and approaches. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for use by non-WS entities. Technical assistance may be provided through a personal or telephone consultation, or during an on-site

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

visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems. These strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor by WS results in tolerance/acceptance of the situation. In other instances, management options are discussed and recommended.

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

Direct Damage Management Assistance

Direct damage management assistance includes damage management activities that are directly conducted or supervised by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and when *Agreements for Control* or other comparable instruments are provided for direct damage management by WS. The initial investigation defines the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary or if the problems are complex.

Educational Efforts

Education is an important element of WS program activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures, courses, and demonstrations are provided to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, 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.

Examples of WS Technical Assistance and Direct MDM in Ohio

Ohio State University Airport (OSU) entered into a Cooperative Service Agreement with Ohio WS for the purpose of assessing, managing, and monitoring wildlife-related public safety and

aviation hazards at OSU Airport. Mammal-aircraft strikes and hazards involving white-tailed deer, red fox, coyotes, woodchucks and other mammals have created safety hazards at the airport. WS has implemented an IWDM approach consisting of technical assistance and direct damage management components including: WS review of airport development and landscaping plans, habitat management recommendations, hazardous mammal species population management, and exclusion. WS involvement at OSU airport has considerably reduced or prevented strikes with hazardous mammal species at the airport.

A private company entered in to a Cooperative Service Agreement with Ohio WS for the purpose of mitigating their wildlife damage issues regarding woodchucks. An overabundance of woodchucks was reported on the property causing thousands of dollars in property damage due to burrowing. Burrowing mammals such as woodchucks potentially risk the integrity of the property structure and create potentially unsafe conditions for employees and visitors. WS implemented an IWDM approach consisting of technical assistance and direct damage management. Direct damage management components include cage traps, conibear traps, exclusion, and shooting. WS involvement at this facility has considerably reduced and prevented hazardous conditions caused by woodchucks and other mammals at the site.

A city entity in north east Ohio entered into a Cooperative Service Agreement with Ohio WS for the purpose of protecting its citizens' safety and property from an overabundant white-tailed deer herd. Deer cause significant property damage through browsing, and also pose a risk to driver safety in the form of vehicle accidents. WS implemented an IWDM program consisting of technical assistance, site selection and direct damage management. Components used to reduce damage caused by white-tailed deer included shooting. Since the inception of this CSA in 2011, the city and its citizens have seen a dramatic decrease in vehicle collisions as well as reduced property damage.

3.2.3 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model and described by Slate et al. (1992) (Figure 3-1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate to reduce damage. WS personnel assess the problem then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions.

3.3 MAMMAL DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE (See Appendix B for a more detailed description of each method or approach.)

3.3.1 Non-lethal Methods

Non-lethal methods are often used by the cooperators before and/or after requesting assistance from WS. It is not unusual for cooperators to have already tried non-lethal methods prior to requesting assistance from WS. For example, in a 2010 NASS Nationwide survey of cattle producers, Ohio cattle producers reported using frequent checking (12.3%), livestock guarding animals (22.9%), night penning (7.6%), exclusion fencing (45.9%), livestock carcass removal (6.8%), culling of sick or injured animals (12.2%), and fright tactics (4.1%), other Non-lethal (15.4%) and herding (0.3%) to prevent predation losses (NASS 2010). In a similar 2005 survey, sheep producers, reported using fencing (48.2%), shed lambing (23.2%), culling of sick/injured animals (11.7%), night penning (38.3%), frequent checks (11.4%), changing bedding (6.6%), removing carrion (6.0%), guard dogs (26.5%), guard llamas (20.4%), guard donkeys (10.2%), herding (0.8%), and frightening devices (1.8%), other (5.3%) to prevent predation losses (NASS 2005).

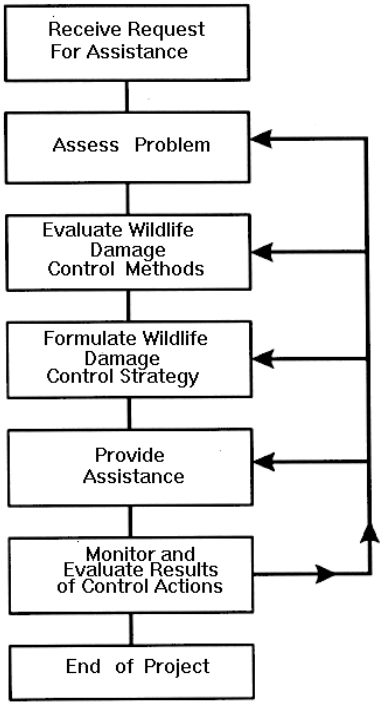

Figure 3.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

Exclusion - (tree wraps, fencing, electrical barriers, paint with sand, beaver exclusion devices, etc) involves physical exclusion of wildlife from protected resources and/or prevention of girdling and gnawing.

Cultural methods and habitat modifications are typically implemented by agricultural producers or property owners. They consist primarily of non-lethal preventive methods which minimize exposure and/or reduce the amount or attractiveness of the protected resource to wildlife that would cause damage or pose a threat. A few examples of these types of techniques are: removal of beaver dams, installation of water control devices, planting lure crops, providing alternate foods, changing animal husbandry practices, switching to short variety crops, picking less palatable varieties of landscape plants, picking up and containing rubbish in mammal resistant containers, providing raptor perching poles, and keeping the vegetation around the protected resource short.

Water Control Devices – Devices, usually pipe systems, developed to allow water to pass through a beaver dam and enable landowner/manager to retain beaver and benefits associated with beaver and beaver ponds while minimizing negative impacts from impounded water.

Beaver Dam Breaching/Removal - Beaver dam breaching/removal involves the removal of debris deposited by beaver that impedes water flow. Debris would be removed from beaver dams with binary explosives, mechanical equipment, or hand tools.

Animal behavior modification refers to tactics that alter the behavior of animals to reduce damage. Some of these tactics include propane exploders, pyrotechnics, distress calls and sound producing devices, visual repellents and other scaring tactics, and livestock guarding animals.

Repellents are usually naturally occurring substances that are chemically formulated to be distasteful or to elicit pain or discomfort to target animals when they are encountered. In Ohio, wildlife repellents are registered with the ODW.

Non-lethal Capture Devices, including Hancock/Bailey Traps, foot-hold traps, corral traps, and box/cage traps are used to capture wildlife. Snares can also be modified to live-capture animals. These devices hold the animal until the Specialist arrives and relocates the animal. Alternatively, when monitoring for diseases in wildlife, samples may be collected and then the animal is released at the capture site. WS could also use these capture methods for animals to be outfitted with transmitters used for wildlife research. These same devices can be used as lethal methods if the specialist euthanizes the captured animals via gunshot or euthanasia chemicals discussed below.

Drugs such as anesthetics (Ketamine, Telazol), sedatives (analgesics) (Xylazine), and accessory drugs (Yohimbine, antibiotics, etc.) are used to capture, sedate, and handle animals involved in wildlife damage or disease situations. They may also be used to capture animals to receive transmitters for research purposes. These and other drugs are available for WS use, pursuant to State and Federal regulations, and are identified as approved drugs by the WS program through its Immobilization and Euthanasia Committee.

Relocation is accomplished through use of traps, nets or tranquilizer chemicals designed to capture mammals alive. Captured target mammals can then be relocated to other field locations or to animal shelters, pursuant to State laws and regulations. WS is authorized to relocate any species of mammal except striped skunks (euthanasia or release on site is mandatory), Virginia opossum (euthanasia or release onsite), beaver (euthanasia or release onsite), coyote (euthanasia or release onsite), fox (euthanasia or release onsite) and raccoons (euthanasia or release onsite). When relocation is to be used, WS would work with ODW to identify suitable relocation sites.

3.3.2 Lethal Methods

Lethal Capture Devices, including body-gripping traps (Conibear), snap traps and some snares designed to kill the captured animal.

Non-lethal capture devices as discussed above can also be used as lethal methods when the captured animal is killed via shooting or euthanasia chemicals discussed below.

Shooting is helpful in some situations to supplement and reinforce other dispersal techniques and to kill mammals that are legally trapped. It is selective for target species and may be used in conjunction with the use of spotlights, calling, and other legal tools such as elevated positions, stands, etc.). Shooting with firearms is sometimes used to manage mammal damage problems when lethal methods are determined to be appropriate. The animals are killed as quickly and humanely as possible.

Colony traps are multiple catch traps used mainly to capture muskrats. Colony traps are usually set at the entrance of a muskrat den and can be used for kill-trapping or live-trapping muskrats. All muskrats live-captured would be euthanized by shooting.

Sport harvest through hunting and trapping is often an important part of MDM strategies and is recommended by WS to enhance the effectiveness of other damage management techniques and to accomplish population management objectives developed by the ODW.

Livestock Protection Collars (LPC) is a protective collar worn by sheep and lambs that has two pockets containing sodium fluoroacetate (Compound 1080). When a coyote attacks a sheep by biting the neck which is common, the chemical is dispensed and kills the coyote. The LPC containing sodium fluoroacetate is the only chemical registered for use in Ohio to protect livestock from predation by canids. The LPC were first registered for use in Ohio in 2004. The LPC have been employed by WS on two occasions since registration occurred in Ohio. Collars were used to protect sheep during one coyote depredation incident in 2005, and one incident of coyote depredation of sheep that occurred in 2007. In each incidence, one coyote was lethally taken with no further incidents of depredation occurring. Collars were used for a total of 529 collar-nights during those two incidents in Ohio.

Zinc Phosphide (ZP) is a metallic pesticide used to reduce damage by woodchucks. This chemical would be registered with ODA prior to use. Zinc phosphide is used to reduce groundhog damage in rock rip rap areas by applying the chemical to bait. The maximum application rate is 10 lbs of bait (0.6% active ingredient) per raft placed no closer than 50 feet apart, (EPA Reg. No. 56228-6). It has a strong, pungent, garlic-like odor that actually is attractive to rodents such as woodchucks, but may be unattractive to some non-target species. Zinc phosphide comes in prepared baits on wheat and oats, or it can be prepared on apples, carrots, or other baits attractive to the target animal. Bait stations and other barriers (e.g., placing bait under a shingle or board) would be used as needed to restrict/prevent access by non-target species.

Gas Cartridges are incendiary devices designed to give off carbon monoxide and other poisonous gases and smoke when ignited. They are used to fumigate burrows of certain rodents and other mammals.

Carbon dioxide (CO_2) gas is an AVMA-approved euthanasia method (AVMA 2001) which is sometimes used to euthanize mammals that have been chemically immobilized or captured in live traps. Live animals are placed in an enclosed space into which CO_2 gas is released. The animals quickly expire after inhaling the CO_2.

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. The AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of small rodents, poultry and other small birds (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).

Euthanasia agents (Sodium Pentobarbital and its derivatives, Potassium Chloride) are used to euthanize animals involved in wildlife damage or disease situations. These and other drugs are available for WS use, pursuant to State and Federal regulations, and are identified as approved drugs by the WS program through its Immobilization and Euthanasia Committee.

3.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

3.4.1 Lethal Mammal Damage Management Only By WS

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

3.4.2 Compensation for Mammal Damage Losses

Compensation problems involve reimbursing individuals for the losses caused by wildlife. Compensation programs do not remove the problem nor do they assist with reducing future losses from predation. The compensation alternative would require the establishment of a system to reimburse persons impacted by mammal damage. This alternative was eliminated from further analysis because no federal or state laws currently exist to authorize such action. Under such an alternative, WS would not provide any technical assistance or direct damage management. Aside from lack of legal authority, analyses of this strategy (Wagner et al. 1997) have identified many drawbacks including:

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

- Compensation would most likely be less than full market value. Responding in a timely fashion to all requests to assess and confirm damage would be difficult and certain types of damage could not be conclusively verified. For example, proving conclusively in individual situations that mammals were responsible for disease outbreaks would be impossible, even though they may actually have been responsible. Thus, a compensation program that requires verification would not meet its objective for mitigating such losses.

- 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.

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

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

The Ohio Department of Agriculture held an indemnity program in the state of Ohio. This program had a budget of $60,000 annually to reimburse coyote and black vulture losses to producers. For a time, this program helped livestock producers recover some of their monetary losses due to livestock depredation. At the present time, this program no longer exists in the state of Ohio due to budgetary concerns.

3.4.3 Reproduction Control

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

been ongoing, and the approach will probably be considered in an increasing variety of wildlife management situations.

Prior to implementation, this method must be registered and approved by the appropriate federal and state regulatory agencies. No chemical or biological agent to accomplish reproductive control for the free-ranging mammals described in this EA has been approved for operational use by Federal and Ohio authorities. At the present time, ODW prohibits the use of birth control in wild mammals in the state of Ohio.

Because there is no tool currently available for field application, and due to considerable logistic, economic, and socio-cultural limitations to the use of fertility control on free-ranging mammals, this approach is not considered for further analysis in this EA. However research into this area of wildlife damage management continues. WS will monitor new developments and, where practical and appropriate, could incorporate reproductive control techniques into its program with approval by the ODW and after necessary NEPA review is completed.

3.4.4 Exhaust All Feasible Non-lethal Methods Before Using Lethal Methods

This alternative would require that non-lethal methods or techniques described in Appendix B be applied to all requests for assistance to reduce mammal damage. If the use of non-lethal methods failed to resolve damage in each 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 damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by those entities where mammal damage has occurred on their property or the use of lethal methods by other entities on their property.

Those entities seeking assistance from WS often employ non-lethal methods to reduce predation risks 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 would be necessary before the initiation of lethal methods. Thus, only the presence or absence of non-lethal methods could be evaluated. The proposed action (Alternative 2) is similar to a non-lethal before lethal alternative because the use of non-lethal methods would be 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.

3.5 STANDARD OPERATING PROCEDURES (SOPs) FOR MAMMAL DAMAGE MANAGEMENT

The current WS program, nationwide and in Ohio, has developed SOPs and Directives for its activities that reduce the potential impacts of these actions on the environment. Key standard operating procedures pertinent to the proposed action and alternatives of this EA are listed below. WS Directives are available at http://www.aphis.usda.gov/wildlife_damage/ws_dir_ch1.shtml.

Target, Non-target, and Threatened and Endangered Species

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

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

- WS will consult with the ODW and USFWS regarding potential impacts on T&E species prior to conducting any beaver dam removal activities in areas where a wetland may have developed as the result of a beaver pond (e.g., areas where the pond has been present more than 3 yrs).

- WS will consult with the ODW prior to using rodenticides in counties where state-listed rodents may occur.

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

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

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

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

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

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

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

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

Health and Safety

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

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

- All WS actions are conducted in accordance with applicable state, federal and local laws, including regulations mandating that traps be checked at least once each calendar day.

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

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

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

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

Humaneness and Animal Welfare Concerns of Methods Used

- All WS actions are conducted in accordance with applicable state, federal and local laws, including regulations mandating that traps be checked at least once each calendar day.

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

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

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

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

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

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

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

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

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.

Effects on sites or resources protected under the National Historic Preservation Act: WS MDM actions are not undertakings that could adversely affect historic resources (See Section 1.6.4).

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

4.1.1 Effects on Target Mammal Species Populations

Alternative 1: Technical Assistance Only

Under this alternative, WS would have no impact on target mammal populations because WS would not conduct any operational MDM activities. The program would be limited to providing advice only. It is likely that most landowners/resource managers would continue to attempt to do

something about their mammal damage as permitted under Ohio state law. 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 non-target species may be taken than with a professional WDM program (Alternatives 2). Use of WS technical assistance may decrease the risks associated with uninformed use of lethal management techniques and may increase the use of non-lethal alternatives over that expected in the absence of any WS involvement (Alternative 4). Overall impacts on target species populations would be similar to or slightly higher than Alternative 2 depending upon the extent to which resource managers use the technical assistance provided by WS. However, for the reasons presented in the population effects analysis in section 4.1.1, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Magnitude is considered by WS as a measure of the number of animals killed in relation to their abundance. 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.

Table 4-1. Wild and feral mammals lethally removed by WS to reduce mammal damage and risks to human health and safety in Ohio during FY 2010-2012.

	# Animals removed				
Species	2010	2011	2012	Snares	Non-chemical Other[2]
Beaver	2	1	2	5	0
Feral Cats	4	4	4	1	11
Coyote	28	36	31	52	43
Feral Dogs	0	0	1	1	0
Red Fox	1	4	1	2	4
Woodchucks	95	51	104	16	234
Mink	1	0	0	0	1
Virginia Opossum	6	30	50	3	83
Cottontail Rabbit	11	5	7	1	22
Raccoons	191	1008	539	10	1719
Stiped Skunk	45	55	10	1	109
Gray Squirrels	0	0	1	0	1
Muskrats	5	16	6	0	27

[1] When live traps are used as lethal techniques, animals captured are killed by gunshot or with euthanasia chemicals described in Section 3.3. Ohio law prohibits the release/relocation of striped skunks and raccoons (raccoons must be released on the homeowner's property or humanely euthanized),

[2] Non-chemical other includes padded foot-hold traps and hand caught.)

Furbearers

In Ohio, thirteen species are classified as furbearing mammals based on the Ohio Revised Code (ORC §1501:31-1-02): red fox, gray fox, beaver, muskrat, mink, coyote, bobcat, raccoon, Virginia opossum, river otter, striped skunk, weasel and badger (Ohio Department of Natural Resources website; http://www.dnr.state.oh.us). Populations of all of these species except badger and bobcat are stable and widespread enough that the ODW and Ohio legislature allow regulated trapping. Currently, ODW limits the time available (harvest seasons) for these species, but there are no bag or possession limits except for river otter which is limited to one in Zone B and two in Zone C. The ODW does not currently allow take of badgers or bobcats by licensed hunters and trappers. The ODW may issue permits on a case-by-case basis for the take of badgers and bobcats in situations where there is damage or a risk to human safety that cannot be resolved using non-lethal methods. WS will consult with the ODW on a case-by-case basis in situations involving damage by badgers and bobcats.

The Ohio Division of Wildlife uses a Bowhunter Survey to track year-to-year changes in furbearer populations and also monitor the sale of pelts. The statewide population trend for coyotes appears to have increased after monitoring leveled off during the early part of 2000 (ODW 2013). Beaver and gray fox population trends appear to have increased in the last few years, while opossum, red fox and raccoon have generally remained stable for the last 5 years (2003-2004 Ohio Wildlife Population Status & Hunting Forecast).

The ODW conducts roadkill surveys in March, April, July, and August for most furbearer species and small game mammals. These surveys allow the ODW to monitor relative changes in population sizes, and to provide sound harvest recommendations (ODW 2010). ODW also uses methods to monitor populations such as recording and investigating verified and unverified sightings of furbearers, road killed animals turned in by the public, photographs, and reported incidental trapping. Estimated fur harvest for target species in this EA are provided in Table 4-2.

Based upon current requests for assistance and anticipated increases in future requests, WS anticipates that no more than 100 red fox, 500 coyotes, 100 Virginia opossum, 10 mink, 200 beaver, 10 gray fox, 10 otter, 10 of each weasel species, and 100 muskrats be lethally removed annually. WS also anticipates that no more than 2000 raccoons and 500 striped skunks would be lethally removed annually. Lethal removal of an additional 2000 individuals per species of raccoons and skunks pertaining to rabies surveillance is covered under the national rabies management EA (USDA 2009b). WS considers that when take is less than 33% of permitted take, the overall magnitude of impact of WS' actions on the species population, singly or cumulatively, is low. For example, WS annual take of beaver has been less than 1% of total annual take permitted by ODW, which is significantly less than the overall population of beaver in the State. WS' MDM actions would only be conducted in small portions of the state. While these actions could result in a reduction in the number of furbearers in a local area, the impact is likely to only be temporary because immigration and natural reproduction will result in re-colonization of the site. Given the low level of WS take relative to all take permitted by the ODW and that WS' actions are limited to specific damage situations in a small portion of the state, the proposed action will not adversely impact the state populations of the below analyzed target species. Additionally, WS does not anticipate taking more than ten individuals per species per year of the following furbearers in the state: gray fox, mink, river otter, and weasel. This low level of localized take should not adversely impact the state population of these furbearer species.

Table 4-2. Annual known take of furbearers in Ohio for FY2011.

Species	Hides Sold[1]	WS Take	Maximum Proposed Annual WS Take
Beaver	2564	2	200
Coyote	3037	31	500
Gray Fox	393	0	10
Mink	3730	1	10
Muskrat	74224	6	100
Opossum	2317	50	100
Otter	42	0	10
Raccoon	99067	539	2000
Red Fox	1685	1	100
Skunk	296	10	500
Weasel	12	0	10

[1] Numbers may be underestimates of licensed take by trappers because not all hides are sold to fur buyers.

Beaver

Beaver populations are monitored by the ODW in early November by a helicopter survey that covers a random sample of survey plots throughout Ohio, with each plot being approximately two square miles. Individual plots are placed into categories (high, moderate, or low beaver potential) based on terrain, percent forest cover and presence of permanent water (ODW 2013*a*). The number of beaver colonies, their location, condition, and habitat are recorded for each plot, and the number of colonies/mi² is expanded to provide a range-wide annual index for the beaver population (ODW 2013*a*). The long-term beaver population is also estimated from the harvest reports from fur trappers and fur buyers. Recent trends have indicated a slight decrease in animals harvested, but still maintaining an average of 34,400 beavers harvested from 2002 to 2011 (ODW 2013*a*).

WS beaver damage management activities would primarily be conducted to alleviate damages to agricultural crops, timber resources, and public property such as roads, bridges, and water management facilities. MDM would also be conducted to enhance or reclaim wildlife and stream fishery/mussel habitats. Activities most often take place on small watershed streams, tributary drainages, and ditches and can best be described as small, one time projects conducted to restore water flow through previously existing channels. Under the preferred alternative, WS would routinely incorporate beaver removal using tools such as traps, and may use dam breaching/removing and/or installation of water control devices and beaver exclusion devices.

With few exceptions, requests from public and private individuals and entities involve trapping and/or dam breaching/removal to return an area back to its preexisting condition. Hydric soils and wetland conditions usually take many years to develop, often greater than five years as recognized by Swampbuster provisions. Most beaver dam removal by WS is either exempt from regulation under Section 404 of the Clean Water Act as stated in 33 CFR Part 323 or may be authorized under the USACE Nationwide Permit System in 33 CFR Part 330. However,

breaching/removal of some beaver dams can involve certain portions of Section 404 to require landowners to obtain permits from the USACE.

WS proposed annual take is expected to be no more than 200 individual beavers per year. Even at maximum take levels, WS proposed take would be less than 1% of the estimated annual fur harvest of beaver in Ohio for year 2011. Given the relatively stable population of beaver in Ohio, in addition to their high reproductive potential, it is predicted that WS' lethal take of beavers would not adversely impact beaver populations in the state.

Coyotes

Prior to 1900, the distribution of the coyote was mainly limited to the short grass prairie region of the western United States (Parker 1995). Two separate colonization events occurred on a northern and southern front as coyotes expanded their range into the eastern United States (Parker 1995 and Moore and Parker 1992). The first confirmed report of a coyote in Ohio was in Logan County in 1919 and Guernsey County in 1920 (Weeks et al. 1990). The coyote now is found in every county in Ohio.

Food habits of eastern coyotes include white-tailed deer, rabbits and rodents, fruits and berries, livestock, birds, and carrion. The white-tailed deer may provide up to 60% of a coyotes diet from January through April and up to 70% in June and July when fawns are especially susceptible (Witmer et al. 1995, Lavigne 1995, Blanton and Hill 1989).

Coyotes breed in late-January through February. After a 63 day gestation cycle, an average of 5 to 7 pups are born (Chambers 1992). Eighty-seven percent of the juveniles will disperse after 12 months and all by 19 months (Lorenz 1978). Radio-marked juveniles dispersed from October through January for distances of 10-42 miles with an average of 30 miles (Berg and Chesness 1978).

WS routinely receives requests for assistance from livestock producers for damage caused by coyotes each year. Requests for assistance are typically from livestock producers experiencing damage losses to sheep, lambs and calves. Most requests for assistance come from the south, south central and southeast portion of the state, where densities of sheep and cattle producers are highest. In 2008, WS provided assistance to 18 livestock producers to manage predation (USDA 2011). WS uses trapping, calling, and shooting, as well as technical assistance and education to control coyote damage to livestock. Although the current livestock protection program in Ohio is small, it is estimated that a comprehensive livestock protection program could potentially save Ohio's economy over $19.67 million dollars annually (USDA 2011).

A reliable estimate of actual coyote numbers is currently unknown. Because determinations of absolute coyote densities are frequently unknown (Knowlton 1972), many researchers have estimated coyote populations using various methods (Clark 1972, Knowlton 1972, Camenzind 1978, USDI 1979, Pyrah 1984). The cost to accurately determine absolute coyote densities over large areas is prohibitive (Connolly 1992) and would not appear to be warranted given the coyote's overall relative abundance. The presence of unusual food concentrations and the assistance provided to a breeding pair by non-breeding coyotes at the den can influence coyote

densities and complicate efforts to estimate abundance (Danner and Smith 1980). Coyote densities are lowest in late winter prior to whelping, highest immediately after whelping, followed by a continued decline to the next whelping season (Parker 1995).

Although coyote densities vary considerably between habitat types and vary based on numerous environmental variables, Knowlton (1972) estimated that an average population density was likely between 0.5 and 1.0 coyote/mi^2 over the entire range in the United States. Coyote densities range from 0.2/mi^2 when populations are low (pre-whelping) to 3.6 coyotes/mi^2 when populations are high (post-whelping) (USDI 1979, Knowlton 1972). Knowlton (1972) concluded that coyote densities may approach a high of 5-6 coyotes/mi^2 under extremely favorable conditions with densities of 0.5 to 1.0/mi^2 possible throughout much of their range. Such an estimate is speculative but represents some the best available information for estimating coyote populations. Using a coyote population density of 0.5 to 1.0 coyote/mi^2 and the total area of Ohio of 44,820 mi^2 (U.S. Census Bureau unpublished data), a statewide coyote population could be estimated at 22,410 to 44,820 coyotes.

To provide for a reasonable margin of error, the impact analysis for this document will use a population density of the lowest estimated population density determined by Knowlton (1972). Using the lowest estimated population (0.5 coyotes/mi^2) the statewide coyote population would be estimated at 22,410 coyotes. If the coyote population remains stable or increases annually, WS' take of up to 500 coyotes to alleviate damage would range from 1.1% to 2.2% of the estimated population and 4.5% of the worst case scenario. The highest number of coyote pelts sold to Ohio fur dealers occurred after the 2010- 2011 trapping season when 3,037pelts were sold. The take of coyotes beyond that reported sold to fur buyers is unknown. Using 3,037pelts sold as a rate of non-WS take, the cumulative take of coyotes by WS and other known entities would represent 7.9% to 15.7% of the estimated population and 32% of the worst case scenario. There is no indication that the combined take by sportsman and WS has or will reach a magnitude that would cause a decline in the coyote population. The number of coyotes observed by bow hunters has remained steady despite take by WS and by other entities.

Coyote populations can withstand a harvest of up to 70% of the population annually (Connolly and Longhurst 1975). The proposed take of up to 500 coyotes by WS and the take of coyotes by other entities is not likely to adversely affect coyote populations. Thus, cumulative take appears to be beneath the level that would begin to cause a decline in the coyote population. The ODW has concurred with WS' finding that coyote damage management activities will not adversely affect statewide coyote populations (personal consultation, Suzie Prange, ODW 2013).

Red Fox

Red foxes are the most common and well-known species in the genus Vulpes and are the most widely distributed non-specific predators in the world (Voigt 1987). The red fox occurs throughout Ohio and prefers diverse habitat that is made up of a patchwork of woodlots, open meadows, dense brush, pastures, and small wetlands (Henry 1986). Red foxes are regarded as nuisance predators in many regions, preying on wildlife and livestock, and have become notorious in many areas of the world as carriers of diseases (Ables 1969, Andrews et al. 1973, Tabel et al. 1974, Tullar et al. 1976, Pils and Martin 1978, Sargeant 1978, Voigt 1987, Allen and

Sargeant 1993). Red foxes have been the subject of many studies during the last 20 years and investigations have revealed that foxes are extremely adaptive and diverse in their behavior and use of habitats.

Red foxes feeding habits are governed by the relative availability of foods with rabbits and mice usually making up over half of the food consumed (Nelson 1933). Other foods include squirrels, muskrats, quail, songbirds, insects, fruits and nuts (Pils and Martin 1978).

WS receives few formal requests to respond to damage caused by red fox. However, WS routinely responds to mammal threats to aircraft involving red fox during routine direct control activities at airports. In addition, red foxes may be incidentally captured or potentially targeted during response to livestock predation management.

Red fox densities are difficult to determine because of the species' secretive and elusive nature. However, researchers have documented that the red fox has high reproductive and dispersal rates and thus, can withstand high mortality (Allen and Sargeant 1993, Voigt 1987, Voigt and MacDonald 1984, Harris 1979, Pils and Martin 1978, Storm et al. 1976, Andrews et al. 1973, Phillips and Mech 1970). Phillips (1970) stated that fox populations are resilient and in order 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 2010, WS in Ohio removed three red foxes during direct control operations. Proposed take by WS is anticipated at no more than 100 red foxes, which at the proposed maximum take is still less than 15% of all reported fur harvest of that species for 2010. Given the red foxes' high reproductive and dispersal rate, and their documented ability to withstand high mortality, WS' take of red fox could be considered as a low magnitude of take when compared to the number of red fox pelts sold annually in the State. WS' proposed take will not adversely affect the ability of those persons interested to harvest red fox during the regulated season based on the low magnitude of take. Based on current information, WS' continued take of red fox to alleviate damage when conducted with the parameters analyzed in the EA will continue to have no adverse effect on red fox populations.

Virginia Opossum

Opossums are the only marsupials (*i.e.*, possess a pouch in which young are reared) found north of Mexico (Seidensticker et al. 1987). They climb well and feed on a variety of foods, including carrion, which forms much of its diet. In addition, opossum eat insects, frogs, birds, snakes, small mammals, earthworms, and berries and other fruits; persimmons, apples, and corn are favorite foods (National Audubon Society 2000). The reproductive season of the Virginia opossum typically occurs from December to February, depending on latitude (Gardner 1982). Gestation is short (average of 12.8 days) with 1 to 17 young born in an embryonic state which climb up the mothers belly to the marsupium (pouch), attach to teats, and begin to suckle (Gardner 1982, National Audubon Society 2000). Those young remain in the pouch for about two months at which time they will begin to explore and may be found traveling on their mother's back with their tails grasping hers (Whitaker, Jr., and Hamilton, Jr. 1998).

Opossums live for only one to two years, with as few as 8% of a population of those animals surviving into the second year in a Virginia study conducted by Seidensticker et al. (1987). In that five-year study, it was also observed that there was a wide variation in opossum densities, in what was considered excellent habitat for the species. However, the mean density during the study was 10.1 opossum per square mile with a range of 1.3 opossum per square mile to 20.2 opossum per square mile (Seidensticker et al. 1987). This was comparable to other opossum population densities in similar habitats in Virginia. Verts (1963) found a density estimate of 10.1 opossum per square mile in farmland areas in Illinois while Wiseman and Hendrickson (1950) found a density of 6.0 opossum per square mile in mixed pasture and woodlands in Iowa. However, VanDruff (1971) found opossum densities in waterfowl nesting habitat as high as 259 opossum per square mile.

Opossums are common throughout Ohio in appropriate habitat; however, no population estimates are available. Therefore, a population estimate will be derived based on the best available information for opossum to provide an indication of the magnitude of take proposed by WS to alleviate damage and threats of damage. The rural land area of Ohio covers 33,436 mi^2. If opossum were only found on 50% of the rural land area using a mean density of 10.1 opossum per square mile found by Seidensticker et al. (1987) in Virginia, the population would be conservatively estimated at 168,852 opossum. Using the range of opossum found by Seidensticker et al. (1987) estimated at 1.3 opossum per square mile to 20.2 opossum per square mile and only 50% of the rural land area of the State being occupied by opossum, the statewide population would range from a low of 21,733 opossum to a high of 337,703 opossum. Opossum can be found in a variety of habitats, including urban areas, so opossum occupying only 50% of the rural land area of the State is unlikely since opossum can be found almost statewide. However, opossum occupying only 50% of the rural land area was used to provide a minimum population estimate to determine the magnitude of the proposed take by WS to alleviate or prevent damage. Opossum are considered a furbearing species in the State and can be harvested during annual hunting and trapping seasons with no limit on the number that could be taken during those seasons. WS continues to receive limited requests for mostly technical assistance associated with opossum. Most damage reports are associated with potential depredation from opossums to State threatened turtle species. Based on previous requests for assistance received by WS and in anticipation of additional requests for assistance, WS could lethally remove up to 100 opossum annually. Given the range of population estimates, the take of 100 opossum by WS annually would represent from 0.03% to 0.5% of the estimated statewide population if the overall population remains at least stable.

Although yearly rates have fluctuated, opossums appear to be maintaining relatively stable populations across Ohio (ODW 2010). The ODW allows an unlimited number of opossum to be harvested during the annual hunting and trapping season, which provides an indication the population of opossum is not likely to decline from overharvest. The permitting of the take by the ODW ensures take would occur within population objectives established by the Department. Although the number of opossum lethally taken during the annual harvest seasons and for damage management is unknown, the cumulative take of opossum, including the proposed take of up to 100 opossum annually by WS, would be of a low magnitude when compared to the

actual statewide opossum population.

Muskrat

Muskrats occur over most of North America and utilize both fresh and marine wetlands and streams. These animals feed mainly on cattails and a multitude of other aquatic vegetation. They also feed on fruits, insects, crayfish, freshwater mussels, frogs, sluggish fish, young birds, and carrion. Muskrats live in "houses" in the water, made of vegetation. Muskrats are prolific breeders, producing two litters of young each year. Litter size varies from one to 14, with six to seven being the average number of young. However, their short life span and numerous mortality factors cause severe short-term population fluctuations (Godin 1977).

No population estimates exists for muskrat in Ohio. However, the 2009-2010 fur buyer data for Ohio indicates that approximately 40,700 muskrat pelts were sold by licensed trappers in Ohio (ODW 2010). Therefore, WS proposed take of 100 muskrats would represent only 0.2% of the estimated annual harvest. Given the reproductive capacity of muskrats, hunter harvest levels, and the isolated scope of the action, the proposed take of 100 muskrats will not have an adverse cumulative impact on the state muskrat population, nor will it adversely affect the ability of those persons interested to harvest muskrat during the regulated season.

Striped Skunk

The striped skunk is an omnivore, feeding heavily on insects such as grasshoppers and crickets, beetles and bees and wasps (Godin 1982). The diet of the striped skunk also includes small mammals, the eggs of ground-nesting birds, and amphibians. Striped skunks are typically not aggressive and attempt to flee when people approach (Rosatte 1987). The striped skunk may use abandoned burrows of other animals as a home. They may also dig their own burrow, or use a protected place, such as a hollow log, crevice, or the space beneath a building (National Audubon Society 2000).

Adult skunks begin breeding in late February. Yearling females (born in the preceding year) mate in late March. Gestation usually lasts about seven to 10 weeks, and there is usually only one litter annually. Litters commonly consist of four to six young. Skunk densities vary widely according to season, food sources, and geographic area. Densities have been reported to range from one skunk per 77 acres to one per 10 acres (Rosatte 1987).

No population estimates are available for striped skunks in Ohio. Striped skunks can be found in a variety of habitats across the State. Therefore, a population estimate will be derived based on the best available information for skunks to provide an indication of the magnitude of take proposed by WS to alleviate damage and threats of damage. There are more than 21 million acres of rural land in Ohio. If only 50% of the rural lands throughout the State have sufficient habitat to support stripped skunks, skunks are only found in rural habitat, and skunk densities average one skunk per 77 acres, a statewide striped skunk population could be estimated at nearly 149,351 skunks. Skunks can be found in a variety of habitats, including urban areas, throughout the State; therefore, skunks likely occupy more than 50% of the rural land area in the State. However, to determine the magnitude of the proposed take by WS to alleviate or prevent damage, skunks occupying only 50% of the rural land area was used to provide a minimum

population estimate.

Population trend data for skunks is acquired through spring road kill surveys throughout four geographic regions of Ohio. In addition, Bowhunter surveys offer insight into yearly population trends, but have indicated that populations of skunks, although low in some areas, exist in all counties of Ohio. Although yearly rates have fluctuated, skunks appear to be maintaining relatively stable populations across Ohio (ODW 2010). Major mortality factors for skunks are typically disease-related, and diseases and/or parasites may serve to reduce population sizes periodically. The potential impact of canine distemper is greater for skunks than opossums. Winter severity may also affect skunk population size, although its effect is dependent upon skunk condition at the onset of winter (ODW 2010).

The overall sale of skunk pelts by licensed fur trappers in the 2009-2010 season was only 160; most likely an indication of market value as opposed to low populations. Corresponding road kill surveys from that year show a rebounding trend in animals collected per 1,000 miles driven as opposed to previous years.

Between FY 2008 to FY2012, WS only removed 226 skunks during trapping activities aimed at enhanced surveillance sampling. Skunks may be targeted during meso-predator control activities to protect State threatened turtle species. Even considering the possibility of a future increase meso-predator reduction aimed to protect threatened and endangered species, it is not anticipated that annual take will exceed 500 skunks.

Based on the best available information on skunk densities, the minimum population in the State could be estimated at 149,351 skunks. Skunks maintain sufficient densities to allow for annual hunting and trapping seasons that allow an unlimited number of skunks to be harvested during the open season. However, the number of skunks harvested during the annual hunting and trapping seasons and to alleviate damage is currently unknown.

With a statewide population estimated at 149,351 skunks, an annual take of up to 500 skunks by WS would represent 0.3% of the population, if the population remains at least stable. The unlimited harvest allowed by the ODW during the annual hunting and trapping seasons provides some indication the population of skunks in the State is not subject to overharvest during the annual harvest seasons and from damage management activities. Given the relatively small take compared to the minimum population estimate, the proposed take of 500 skunks will not have an adverse cumulative impact on the state skunk population, nor will it adversely affect the ability of those persons interested to harvest skunk during the regulated season.

Raccoon

The raccoon is one of the most omnivorous of all animals. It will eat carrion, garbage, birds, mammals, insects, crayfish, mussels, other invertebrates, and a wide variety of grains, various fruits, other plant materials and most or all foods prepared for human or animal consumption (Sanderson 1987). They occasionally kill poultry (Boggess 1994), and come into conflict with man frequently in urban and suburban environments by raiding garbage cans and pet food sources.

Since the 1940s, raccoons have been increasing in number and range throughout North America. Declines in raccoon harvest due to low pelt prices are partially responsible for the increase. Substantial increases in urbanization, however, also began in the 1940s and continue today. Thus, the relative increase in raccoons across Ohio is not surprising and is similar to trends elsewhere in North America. Canine distemper is the primary disease affecting raccoon populations and can periodically reduce numbers (ODW 2010). However, in 2007 high densities of raccoons with rabies were discovered in northeast Ohio, which may have contributed to reductions in populations in those areas. Statewide bow hunter surveys conducted by ODW reinforce this in certain counties, showing that nearly one third of the counties in Ohio have a high density of raccoons (ODW 2010). An increase in roadkill surveillance rates in 2010 indicated that raccoon populations have already begun to rebound from any reduction due to disease (ODW 2010).

WS continues to receive requests for damage control associated with raccoons. Most requests for assistance involve meso-predator control for protection of State threatened turtle species. In Ohio, WS also receives damage requests for raccoons in urban areas and offers technical assistance for these requests, and routinely refers direct control work to private nuisance control operators. From FY2010 to FY2012, WS distributed 460 informational leaflets on controlling raccoon damage to citizens experiencing damage.

Absolute raccoon population densities are difficult or impossible to determine because of the difficulty in knowing the percentage of the population that has already been counted or estimated and the additional difficulty of knowing how large an area the raccoons are using (Sanderson 1987). Due to their adaptability, raccoon densities reach higher levels in urban areas than that of rural areas. Studies in suburban Cincinnati, Ohio illustrate that residential areas support very high densities of raccoons; as high as 69 individuals/ km^2 (Johnson 1970, Hoffman and Gottschang 1977). Overall, raccoon populations are stable in Ohio, with some urban areas having extremely high densities.

Relative densities, along with age structure and sex ratios, serve as indices to raccoon population status. APHIS-WS has conducted more than 255 raccoon relative density studies since 1997. These studies indicate that density indices, ranging from 0-70 raccoons/km^2 (average of 12 raccoons/km^2), are well within the documented range of estimates reported in other studies (USDA 2009).

To determine the magnitude of the proposed take by WS to alleviate or prevent damage, WS will consider the lowest mean density of 1.5 to 8 raccoons/km^2. Using this density, the estimated raccoon population in Ohio would range from 159,101 to 848,536 individuals (USDA 2009). The proposed annual take of up to 2000 raccoons by WS would represent 1.3% of the minimum population, if the population remains at least stable. The unlimited harvest allowed by the ODW during the annual hunting and trapping seasons provides some indication the population of raccoons in the State is not subject to overharvest during the annual harvest seasons and from damage management activities. Given the relatively small take compared to the minimum population estimate, the proposed take of 2000 raccoons will not have an adverse cumulative

impact on the state raccoon population, nor will it adversely affect the ability of those persons interested in harvesting raccoons during the regulated season.

Bobcats

The bobcat is a species that is native to Ohio, and one of seven feral cat species found in North America. Bobcats are very rarely seen in Ohio as they were extirpated from the state in 1850. Prior to settlement, they were common throughout Ohio. Bobcats produce litters ranging from one to six kittens per year. Rabbits and rodents make up the primary diet, although deer are an important food source in the northern portions of the bobcat's range (ODW 2009*a*).

Between 1970 and 2009, there have been 359 verified reports of bobcats in the state; 92 of these reports occurred in 2009. The ODW confirmed 136 sightings in 2011. The number of sightings has continuously increased since 2001 (ODW 2009*a*).

Requests for damage management assistance from WS concerning bobcats in Ohio are minimal, but may increase as the animals expand their range throughout the State. WS currently offers assistance to ODW with trapping, collaring, and releasing bobcats for research purposes. As populations continue to grow, it is possible that future requests for damage assistance may be received by WS. In the event that there is a future need for WS to take bobcats in response to mammal damage reports, it is anticipated that no more than five bobcats will be lethally removed annually in the State.

Bobcats are managed by the ODW and recognized as a state-threatened species. As such, WS would consult the ODW prior to any take of bobcats. Given the oversight of the ODW and the increasing trend in bobcat sightings, WS' take of up to five bobcats would not have an adverse effect on the state population.

Badgers

Badgers go largely unnoticed in Ohio because of their secretive and nocturnal nature. Their short, stout bodies are built for rapid digging so they are capable of hiding themselves quickly when alarmed. Because of these traits, it is difficult to get an accurate estimate of population size. Badgers produce litters ranging from one to five young per year. Small rodents make up the primary diet, although small birds and eggs are also consumed (ODW 2009*b*).

WS does not receive requests for technical assistance involving badgers, but may in the future as populations expand throughout the State. Also, considering the badger's propensity to dig large burrows, it is possible that badgers may contribute to the undermining of the structural integrity of surrounding agricultural fields. In such an event, WS may be contacted to conduct direct control operations for badger. Given the low probability of this in the near future, it is anticipated that WS will take no more than five badgers annually.

The American badger is listed as an Ohio Species of Concern by the ODW. As such, WS would consult the ODW prior to any take of badgers. Given the oversight of the ODW and the increasing trend in the badger population, WS' take of up to five badgers would not have an adverse effect on the state population.

Feral Dogs and Wolf-Hybrids

Feral dogs, wolf-hybrids, and exotic carnivores are not native to Ohio and often occur due to abandonment by their owner or by escaping from captivity. Feral wildlife often have negative impacts on native fauna either from competition, predation, or through the transmission of diseases. Though depredation of livestock by feral canids and exotic carnivores occurs infrequently, it is still relevant to the resource owner (USDA 2001).

Injuries and deaths caused by wolf-dog hybrids have received national media attention. The death of a four year old in Florida in August, 1988 by a wolf that, just two hours earlier, had been adopted from an animal shelter set a national precedent for animal shelters/agencies: wolf-dog hybrids are to be put down or returned to their original owner, but are not to be adopted by an uneducated, unsuspecting public. This policy makes it difficult for owners of hybrids to find good homes for animals they cannot manage. Unfortunately, many overwhelmed hybrid owners resort to "setting their wolf free" when they cannot find a suitable home for it. These freed hybrids generally lack the hunting skills and pack structure needed to survive by hunting wild prey. When these animals become hungry they instinctively return to humans for food, create conflict, and often are shot by local enforcement officers. There are currently no known populations of wolf-hybrids or exotic carnivores in Ohio.

Feral dog populations are established in Ohio, but the current population status is unknown. Feral dogs can cause damage by killing or injuring livestock, poultry, house cats, or domestic dogs. They may also feed on fruit crops including melons, berries, grapes, and native fruit. They may also attack people, especially children. This is particularly true where they feed at and live around garbage dumps near human dwellings (Green and Gipson 1994). Since fiscal year 2008, four feral dogs were captured by WS and released to appropriate county dog wardens. WS' take of feral dogs has averaged slightly above one dog per year since fiscal year 2008. Though an increase in the live-capture of feral dogs may occur under the proposed supplement, take is not likely to result in cumulative impacts to feral dog populations in Ohio. Feral dogs are a non-native species in Ohio and could be considered to be negatively impacting native fauna in Ohio. Therefore, any reduction in feral dog populations could be viewed as benefitting native fauna.

This EA analyzes the removal of ten feral dogs, wolf-hybrids, and other exotic carnivores annually. The captured dogs would be returned to the owner or taken to an animal shelter for adoption. Based on previous requests for assistance received by WS and the cumulative take of feral dogs and exotic carnivores, WS take would not exceed ten feral dogs or other species of exotic carnivores annually during all damage management activities.

In future programs, WS may be requested to address damage being caused by feral dogs and exotic carnivores anywhere in Ohio to protect any resource being damaged or threatened. When the removal of feral dogs or exotic carnivores 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 these species 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).
Based upon the above information, WS' limited lethal removal of feral dogs and exotic carnivores would have minimal effects on local or statewide populations of this species in Ohio. 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 or exotic carnivores 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.

Rabbits

Ohio WS receives occasional nuisance complaints about the eastern cottontail rabbits, the most abundant and widespread of the rabbits in the U.S. Population densities for cottontail rabbits vary with habitat quality, but one rabbit per 0.4 hectares (one acre) is a reasonable average (Craven 1994). Rabbits live only 12-15 months, but they can raise as many as six litters per year of one to nine young (usually four to six; National Audubon Society 2000). Division of Wildlife surveys since the 1950s show that rabbit populations have fluctuated annually, but have shown a relatively stable long-term trend (ODW 2013). Cottontails are a regulated game species in Ohio and the ODW has established seasons and limits for this species. Ohio rabbit populations are monitored annually by roadside counts in April and August. Rabbit harvest is monitored annually through hunter surveys conducted each fall (ODW 2013). Cottontail rabbits occur statewide today with highest densities in southern and eastern Ohio. This brushland edge species is Ohio's most popular small game animal. Its adaptability to a variety of habitat types and conditions has allowed it to maintain reasonable numbers in spite of human population growth, habitat loss, and intensive land use.

WS estimates that no more than 100 cottontail rabbits may be taken per year for MDM. Almost all of these would be removed from urban, airport, commercial, or industrial habitats where hunting is not likely to occur. Cottontail rabbit damage management activities would target single rabbits or local populations of the species at sites where their presence was causing unacceptable damage to agriculture, human health or safety, natural resources, or property. Given the high productivity of cottontail rabbits and that WS actions will be confined to very small, scattered portions of the state that are usually not subjected to hunting, WS' limited lethal take of cottontail rabbits would have no adverse impacts on overall rabbit populations.

Tree Squirrels

Fox squirrels and eastern gray squirrels are the primary species involved in squirrel damage complaints. For that reason only those two species will be referenced in this section. Further reference to "squirrels" as a group in this section will be construed to mean these two species.

Gray and fox squirrels are found throughout most of the eastern U. S., including Ohio. They inhabit mixed hardwood forests, especially those containing nut trees such as oak/hickory mix. Gray and fox squirrels are considered small game by the ODW which has established seasons and bag limits for squirrel hunting. During the 2011-2012 Ohio hunting season, hunters harvested 0.59 gray squirrels per hour and 0.65 fox squirrels per hour (ODW 2013*b*). Gray

squirrels produce young during early spring, while fox squirrels have litters around February to early March, but may actually produce at any time until early September (National Audubon Society 2000). Older adults of both species may produce two litters per year (Burt and Grossenheider 1964, Jackson, 1994). The gestation period is 42-45 days, and about three young comprise a litter. Young begin to explore outside the nest at about 10-12 weeks of age (Jackson 1994*b*). Squirrel populations periodically rise and fall, and during periods of high populations they may go on mass emigrations, during which time many animals die. These species are vulnerable to numerous parasites and diseases such as ticks, mange mites, fleas, and internal parasites. Squirrels are also prey for hawks, owls, snakes, and several mammalian predators. 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 1994*b*). Despite annual fluctuations, long-term harvest trends suggest that Ohio's squirrel population has remained relatively stable across both the primary fox and gray squirrel ranges (ODW 2013*b*).

Based upon an anticipated increase for requests for WS assistance, WS anticipates killing no more than 50 squirrels per species per year for MDM in Ohio. These squirrels would almost always be removed from urban and suburban populations which are not hunted. Some local populations may be temporarily reduced as a result of MDM projects aimed at reducing damage at a local project site. Given the widespread and abundant nature of this species, high productivity, low number of squirrels that could be taken relative to the number likely taken by licensed hunters and the limited amount of area in the state where WS would conduct squirrel damage management activities, WS' lethal take of squirrels would not adversely impact gray or fox squirrel populations in Ohio.

Woodchucks

Woodchucks are found throughout Ohio 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).

The ODW is responsible for the management of the states woodchuck population. At this time the ODW does not conduct a population census for woodchucks. There is a set season for hunting woodchucks but no limit on the number of animals that may be taken. During FY 2008-2010, Ohio WS lethally took 950 woodchucks.

To analyze potential impacts of WS' activities on woodchuck populations in Ohio, the best available information will be used to estimate a state-wide population. There are over 13 million acres of currently active farmland in Ohio (FIC 2006). Based on Fergus, there may be an average of one woodchuck per acre of farmland. Using a modest estimate of one woodchuck for every acre of farmland, a conservative statewide woodchuck population could be estimated at approximately 13 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 13 million woodchucks is likely low.

Based on previous activities conducted by WS and in anticipation of receiving additional requests for assistance, up to 1,500 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 13 million woodchucks, take of up to 1,500 woodchucks annually by WS would represent 0.01% 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.

Other Rodents and Insectivores

Native Species: Rodents (mice, voles, etc.) and insectivores (shrews and moles) are taken by WS during wildlife hazard management, assessment, and monitoring at airports and airbases because these species serve as attractants to birds such as raptors and crows, which create direct hazards to aircraft. Additionally, these species may be taken in orchards and other cultivated areas to reduce damage to agricultural resources, such as apple trees and in or near parks, residences, and other structures to protect human health and safety, property, or natural resources.

Native rodents which may be the target of WS activities at airports and other locations include the meadow vole, deer mouse, white-footed mouse and the thirteen-lined ground squirrel, and Eastern chipmunk. Insectivores which may be the target of WS activities at airports and other locations include Eastern mole and short-tailed shrews. The following species are very prolific: meadow vole (up to 17 liters annually, typically 4-5 young per litter), white-footed mouse (multiple litters, five young each), deer mice (3-4 litters, 4-6 young each), and short-tailed shrews (two to three litters with 5 to seven young each) (Godin 1977). Eastern moles and Eastern chipmunks and thirteen-lined ground squirrels have one or two litters per year: Eastern mole (two to five young each), thirteen-lined ground squirrels (usually one litter per year, seven to 10 young), Eastern chipmunk (usually two litters per year with two to five young per litter)(Godin 1977, Burt and Grossenheider 1976, National Audubon Society 2000). Large population fluctuations are characteristic of many small rodent populations.

Method of lethal take for these species by WS would include trapping and use of chemical products such as ZP. Determination of numbers of rodents killed by MDM actions is difficult when lethal chemical methods such as ZP treatments are employed. This is because most animals killed by these methods die underground. Removal of these species by WS would be done at specific isolated sites (e.g., airports, orchards, etc.). Impacts of these activities to rodent

and insectivore populations would be minimal due to the species' relatively high reproductive rates and because rodent/insectivore damage management recommended and conducted by WS would be at a limited number of specific local sites with the use of legal methods. Based upon the above information, WS limited lethal take of small rodents may cause temporary reductions at the specific local sites where WS works, but would have no adverse impacts on overall populations of the species in Ohio.

Non-native Species: Norway Rats, black (roof) rats, and house mice are not native to North America and were accidentally released into this country. In the wild, the impact of these species is seen by many as entirely detrimental (Burt and Grossenheider 1980). These species eat anything digestible and may prey on eggs or offspring of native species and compete with native species for resources. Executive Order 13112 Invasive Species directs Federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health. Although removal of these species up to and including extirpation could be seen as desirable, because of the productivity and distribution of these species and the limited nature of WS work, WS is unlikely to ever do more than limit populations at the specific local sites where WS works. Based on the above information and WS limited lethal take of rodents and insectivores in Ohio, WS should have minimal effects on local or statewide rodent populations.

Feral Swine

Feral swine are a non-native species and are primarily found in the southern portions of the state. ODW currently considers feral swine as an invasive species and does not track harvest or population densities of feral swine. Given current land use trends and the adaptability of feral swine, WS receives requests to provide technical assistance with feral swine damage management and has received requests for samples from feral swine for use in a national feral swine disease surveillance effort. Management of conflicts associated with feral swine are being addressed in this EA so that WS may immediately assist land managers and/or State or Federal agencies in minimizing the impacts of this non-native species on people and ecosystems in the state. WS could be requested to assist with the removal of feral swine either for the reduction of damage cause by feral swine to agricultural and natural resources, for reduction of risks to human health and safety, or for the purposed of disease surveillance and management. Based upon current and anticipated increases in future work, it is anticipated that not more than 400 feral swine would be killed annually by WS in Ohio. Feral swine often have negative impacts on the environment. Therefore, these animals are considered by many wildlife biologists to be an undesirable component of North American wild and native ecosystems. Any reduction in feral swine populations could be considered a beneficial impact to the environment. 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. Accordingly, the removal of feral swine from Ohio would not have an adverse impact to the human environment.

Feral Cats

Feral cats are house cats living in the wild. Cats are found in commensal relationships wherever people are found. In some urban and suburban areas, cat populations equal human populations.

Feral cats produce two to 10 kittens during any month of the year. An adult female may produce three litters per year where food and habitat are sufficient. Cats are opportunistic predators and scavengers that feed on rodents, rabbits, shrews, moles, birds, insects, reptiles, amphibians, fish, carrion, garbage, vegetation, and leftover pet food (Fitzwater 1994). Where it has been documented, the impact of feral cats on wildlife populations in suburban and rural areas, directly by predation, and indirectly by competition for food, has been enormous (Coleman and Temple 1989). In the United Kingdom, one study determined that house cats may take an annual toll of some 70 million animals and birds (Churcher and Lawton 1987). 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. In addition, feral cats serve as a reservoir for human and wildlife diseases, including cat scratch fever, distemper, histoplasmosis, leptospirosis, mumps, plague, rabies, ringworm, salmonellosis, toxoplasmosis, tularemia, and various parasites (Fitzwater 1994).

WS has provided technical and operational assistance with feral cat problems at airport installations in Ohio. When conducting feral cat management projects, WS will give preference to live capture methods. Lethal control will not be used on cats bearing obvious identification (e.g., collars). Although preference will be given to live-capture methods, based on current and anticipated requests for assistance with feral cat management, WS estimates that up to 100 feral cats may be lethally removed by WS per year. WS will only use AVMA approved euthanasia measures for lethal removal of cats. Most nonlethal or lethal removal of cats would be conducted for projects protecting human health and safety, valuable wildlife, or captive birds and other animals. The proposed lethal take of cats is insignificant to the total population of this species in the state. In metropolitan areas of Ohio, animal control officers capture and remove hundreds of feral cats each year. Nationwide, the Humane Society of the United States estimates that between three and four million cats are euthanized in shelters each year (HSUS 2013). 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 this would be considered a beneficial impact on the environment because these species are not considered part of the native ecosystem. However, given the reproductive capacity of feral cats and the limited and localized nature of WS' proposed actions, WS' limited lethal removal of feral cats is unlikely to reduce overall populations of this species in Ohio.

Other Target Species

Target species have been killed in small numbers by WS during the past year and have included no more than 50 individuals of a given species. Other species that could be killed during MDM may include up to 10 individuals of species listed in section 1.1 of this EA may be taken. None of these species are expected to be taken by WS MDM at any level that would adversely affect populations. The list of species that could be targeted under this EA does not include federally-listed T&E species. WS would not conduct MDM involving state-listed T&E or sensitive species without situation specific consultation with ODW. Given ODW oversight, and WS limited lethal take, none of the above mentioned mammal species are expected to be taken by WS MDM at any level that would adversely affect overall mammal populations on a local or statewide basis.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would not take any target mammal species because no lethal methods would be used. Although WS lethal take of mammals would not occur, as with Alternative 1, 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 taken than with a professional MDM program (Alternatives 2). Ready access to WS assistance with non-lethal MDM may decrease private efforts to use lethal techniques. Therefore, take of target species may be less than anticipated with Alternatives 1 and 4. Overall impacts on target species populations would be similar to Alternative 2 depending upon the extent to which resource managers independently use lethal methods. However, for the reasons presented in the population effects analysis under Alternative 2, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

Alternative 4: No Federal WS Mammal Damage Management

Under this alternative, WS would have no impact on target mammal populations in the State. Private efforts to reduce or prevent depredations would likely increase. As with Alternatives 1 and 3, 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. Because resource owners/managers would not have access to WS direct MDM assistance or, at least, technical assistance, impacts may be greater than Alternatives 1 and 3. For the same reasons shown in the population effects analysis under Alternative 2, it is unlikely that target mammal populations would be adversely impacted by implementation of this alternative.

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

Alternative 1: Technical Assistance Only

Effects on Non-target (non-T&E) Species: Under this alternative, WS would not conduct direct MDM activities, and would not take any non-target species. Only technical assistance and self-help information would be provided. The ODW or other natural resource management entities may have to re-allocate staff time and resources for any projects to protect threatened, endangered and rare mammals that would otherwise be conducted by WS. Although technical support might lead to more selective use of control methods by private parties than that which might occur under Alternative 4, private efforts to reduce or prevent depredations could still result in less experienced persons implementing control methods. This may result in greater

risks to non-target wildlife than under the proposed action. It is hypothetically possible that frustration caused by difficulties in addressing wildlife damage problems could lead to use of illegal methods like chemical toxicants which could result in unknown primary (i.e., direct consumption) risks to non-target species populations and increased risks of secondary toxicity (e.g., feeding on animals that had eaten toxicants) to scavengers and predators.

Effects on T&E species: WS will not have any direct impact on T&E species. Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to species like the state-listed bald eagle. Risks to T&E species may be lower with this alternative than with Alternative 4 because WS could advise individuals as to the potential presence of state and federally listed species in their area and could facilitate consultation with the appropriate agency.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Effects on Non-target (non-T&E) Species: The potential adverse effects to non-targets occur from the employment of methods to address mammal damage. The use of non-lethal methods as part of an integrated direct operational assistance program would be similar to those risks to non-targets discussed in the other alternatives.

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

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

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

Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage are intended to elicit fright responses in wildlife. When employing those methods to disperse or harass target species, any non-targets near when those methods are employed would also likely be dispersed from the area. Similarly, any exclusionary device constructed to prevent access by target species also excludes access to non-target species. The persistent use of non-lethal methods will likely result in the dispersal or abandonment of those areas where non-lethal methods are employed of both target and non-target species. Therefore, any use of non-lethal methods has similar results on both non-target and target species. Though non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods can restrict or prevent access of non-targets to beneficial resources. Overall, potential impacts to non-targets from the use of non-lethal methods would not adversely affect populations since those methods are often temporary.

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

Mammals could still be lethally taken during the regulated harvest season, when causing damage, and through the issuance of permits under this alternative. Impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal take would occur. Non-lethal methods would be available under all the alternatives analyzed. WS' involvement in the use of or recommendation of non-lethal methods would ensure non-target impacts are considered under WS' Decision Model. Impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by mammals under this alternative would include shooting, body-gripping traps, and euthanasia after live-capture. Available methods and the application of those methods to resolve mammal damage is further discussed in Appendix B of the EA.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method. An issue that has arisen is the potential for low-level flights associated with using firearms from aircraft could potentially disturb wildlife, including T&E species. Aerial operations would be an important method of damage management in Ohio when used to address damage or threats associated with

feral swine in remote areas where access is limited due to terrain and habitat. Aerial operations would only occur in those areas where a cooperative service agreement allowing the use of aircraft had been signed between WS and the cooperating landowner or manager. Aerial operations would generally be conducted with helicopters between the months of December thru April when the foliage has fallen; however, aircraft could be used at any time of year. The amount of time spent conducting aerial operations varies depending on the severity of damage, the size of the area where damage or threats were occurring, and the weather, as low-level aerial activities would be restricted to visual flight rules and would be impractical in high winds or at times when animals were not easily visible.

Aircraft play an important role in the management of various wildlife species for many agencies. Resource management agencies rely on low flying aircraft to monitor the status of many animal populations including large mammals (Lancia et al. 2000), birds of prey (Fuller and Mosher 1987), waterfowl (Bellrose 1976), and colonial waterbirds (Speich 1986). Low-level flights are also required when aircraft are used to track animal movements by radio telemetry (Gilmer et al. 1981, Samuel and Fuller 1994).

A number of studies have looked at responses of various wildlife species to aircraft overflights. The United States Department of the Interior (1995) reviewed the effects of aircraft overflights on wildlife and suggested that adverse effects could occur to certain species. Some species will frequently or at least occasionally show an adverse response to even minor overflights. In general though, it appears that the more serious potential adverse effects occur when overflights are chronic (*i.e.*, they occur daily or more often over long periods). Chronic exposures generally involve areas near commercial airports and military flight training facilities. Aerial operations conducted by WS rarely occur in the same areas on a daily basis and little time is actually spent flying over those particular areas.

The effects on wildlife from military-type aircraft have been studied extensively (Air National Guard 1997*a*, Air National Guard 1997*b*), and were found to have no expected adverse effects on wildlife. Examples of species or species groups that have been studied with regard to the issue of aircraft-generated disturbance are as follows:

Waterbirds and Waterfowl**:** Low-level overflights of two to three minutes in duration by a fixed-wing airplane and a helicopter produced no "*drastic*" disturbance of tree-nesting colonial waterbirds, and, in 90% of the observations, the individual birds either showed no reaction or merely looked up (Kushlan 1979). Belanger and Bedard (1989, 1990) observed responses of greater snow geese (*Chen caerulescens atlantica*) to man-induced disturbance on a sanctuary area and estimated the energetic cost of such disturbance. Belanger and Bedard (1989, 1990) observed that disturbance rates exceeding two per hour reduced goose use of the sanctuary by 50% the following day. They also observed that about 40% of the disturbances caused interruptions in feeding that would require an estimated 32% increase in nighttime feeding to compensate for the energy lost. They concluded that overflights of sanctuary areas should be strictly regulated to avoid adverse effects. Conomy et al. (1998) quantified behavioral responses of wintering American black ducks (*Anas rubripes*), American wigeon (*A. americana*), gadwall (*A. strepera*), and American green-winged teal (*A. crecca carolinensis*) exposed to low-level

military aircraft and found that only a small percentage (2%) of the birds reacted to the disturbance. They concluded that such disturbance was not adversely affecting the "*time-activity budgets*" of the species. Aerial operations conducted by Wildlife Services would not be conducted over federal, state, or other governmental property without the concurrence of the managing entity. Those flights, if requested, would be conducted to reduce threats and damages occurring to natural resources and should not result in impacts to bird species. Thus, there is little to no potential for any adverse effects on waterbirds and waterfowl.

Raptors: The Air National Guard (1997*a*) analyzed and summarized the effects of overflight studies conducted by numerous federal and state government agencies and private organizations. Those studies determined that military aircraft noise initially startled raptors, but negative responses were brief and did not have an observed effect on productivity (see Ellis 1981, Fraser et al. 1985, Lamp 1989, USFS 1992 as cited in Air National Guard 1997*a*). A study conducted on the impacts of overflights to bald eagles (*Haliaeetus leucocephalus*) suggested that the eagles were not sensitive to this type of disturbance (Fraser et al. 1985). During the study, observations were made of more than 850 overflights of active eagle nests. Only two eagles rose out of either their incubation or brooding postures. This study also showed that perched adults were flushed only 10% of the time during aircraft overflights. Evidence also suggests that Golden Eagles (*Aquila chrysaetos*) are not highly sensitive to noise or other aircraft disturbances (Ellis 1981, Holthuijzen et al. 1990). Finally, one other study found that eagles were particularly resistant to being flushed from their nests (see Awbrey and Bowles 1990 as cited in Air National Guard 1997*a*). Therefore, there is considerable evidence that eagles would not be adversely affected by overflights during aerial operations.

Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period; results showed similar nesting success between hawks subjected to overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but found that Ferruginous hawks (*B. regalis*) were sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, nor did the hawks become alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that five species of hawks, two falcons (*Falco spp.*), and golden eagles (*Aquila chrysaetos*) were "*incredibly tolerant*" of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and the overflights never limited productivity.

Grubb et al. (2010) evaluated golden eagle response to civilian and military (Apache AH-64) helicopter flights in northern Utah. Study results indicated that golden eagles were not adversely affected when exposed to flights ranging from 100 to 800 meters along, towards, and from behind occupied cliff nests. Eagle courtship, nesting, and fledging were not adversely affected, indicating that no special management restrictions were required in the study location.

The above studies indicate raptors were relatively unaffected by aircraft overflights, including those by military aircraft that produce much higher noise levels. Therefore, we conclude that aerial operations would have little or no potential to adversely affect raptors.

Passerines: Reproductive losses have been reported in one study of small territorial passerines ("*perching*" birds that included sparrows, blackbirds) after exposure to low altitude overflights (see Manci et al. 1988 as cited in Air National Guard 1997*a*), but natural mortality rates of both adults and young are high and variable for most species. The research review indicated passerine birds cannot be driven any great distance from a favored food source by a non-specific disturbance, such as military aircraft noise, which indicated quieter noise would have even less effect. Passerines avoid intermittent or unpredictable sources of disturbance more than predictable ones, but return rapidly to feed or roost once the disturbance ceases (Gladwin et al. 1988, USFS 1992). Those studies and reviews indicated there was little or no potential for aerial operations to cause adverse effects on passerine bird species.

Domestic Animals and Small Mammals: A number of studies with laboratory animals (*e.g.*, rodents [Borg 1979]) and domestic animals (*e.g.*, sheep [Ames and Arehart 1972]) have shown that these animals can become habituated to noise. Long-term lab studies of small mammals exposed intermittently to high levels of noise demonstrate no changes in longevity. The physiological "*fight or flight*" response, while marked, does not appear to have any long-term health consequences on small mammals (Air National Guard 1997*a*). Small mammals habituate, although with difficulty, to sound levels greater than 100 dbA (USFS 1992).

The fact that Wildlife Services would only conduct aerial hunting on a very small percentage of the land area of the State indicates that most wildlife would not be exposed to aerial gunning overflights in the State. Further lessening the potential for any adverse impacts is that such flights would occur infrequently throughout the year.

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by mammals, the use of such methods can result in the incidental take of unintended species. Table 4-4 shows the minimal number of non-targets that have been killed by WS since 2010. Those occurrences are rare and should not affect the overall populations of any species under the proposed action. WS' take of non-target species during activities to reduce damage or threats to human safety associated with mammals is expected to be extremely low to non-existent.

Table 4-4: WS non-target capture and take for FY2010-2012

	Total Take from FY2010-2012		Avg. Per Year FY2010-2012	
	Killed	Freed	Killed	Freed
Feral Cats	0	33	0	11
Painted Turtles	0	2	0	0.67
Savannah Sparrows	1	34	0.33	11.3
Bobcat	0	1	0	0.33
Fox Squirrel	0	31	0	10.3
Opossum	2	368	0.67	122.6
Cottontail Rabbit	0	22	0	7.3

Effects on T&E Species:

Bats: Occasionally (once or twice a year), WS receives a request to assist with a threat to human health and safety related to bats (e.g., a bat has bitten or scratched someone and WS is requested to capture the bat so it can be tested for rabies, or a request to remove a bat from a public building). There is one state and federally listed bat species in Ohio (Indiana bat) and two additional state-listed bat species of concern (Rafinesque's big-eared bat, Eastern small-footed bat). The areas where WS provides this type of assistance are generally not the type of habitat used by most of the state and federally listed bats, as well as species of concern in Ohio; however Rafinesque's big-eared bat is known to use buildings. WS personnel who respond to requests for assistance with bats will be trained in the identification of state and federally listed bats in Ohio. In the event that the problem appears to be related to a federally listed bat, WS will contact the USFWS Ohio Field Office or ODW as appropriate. Given the extremely low likelihood that a state or federally listed bat will be at the sites where WS provides assistance, the low frequency of WS' direct assistance with bat management, and that WS' actions rarely result in the death of the bat, the proposed action is unlikely to adversely affect the Indiana bat, Eastern small-footed bat or Rafinesque's big-eared bat. The USFWS and ODW have concurred with WS's no effect assessment.

Rodents: Allegheny woodrats, star-nosed moles, Southern red-backed vole, woodland jumping mice and eastern harvest mice are listed as threatened or endangered, or a species of concern by the state of Ohio. The proposed methods which may pose risks to state listed rodents include use of the rodenticide, ZP, snap traps, and gas cartridges. These methods would primarily be used at airports to reduce wildlife hazards to aircraft and human safety. These methods could also be used in and around barns and industrial facilities, at landfills and in orchards, but due to the lack of suitable available habitat at these types of sites, WS use of rodenticides, gas cartridges or snap traps from this alternative would pose little risk to Allegheny woodrats. Similarly, airports, landfills, and the areas in and around barns and industrial sites are unlikely to provide suitable habitat for the other state-listed rodents, and risks to these species from the proposed methods are likely very low. To reduce risks to state-listed rodents from MDM actions conducted in orchards, WS will consult with the ODW prior to using these methods in counties where these rodents are known to occur. WS will implement any recommendations for the protection of

state-listed rodents which are provided by the ODW. Given that WS' rodent damage management activities are restricted to a limited number of sites and a small area of the state and the protective measures listed above, this alternative will not have an adverse impact on state listed rodents.

Gray Wolves: Gray wolves were removed from the federal list of T&E species in 2007, but wolves are considered extirpated in the state of Ohio. Methods that could pose risks to gray wolves include foot-hold traps and snares. Use of these methods at airports and other enclosed areas which cannot be accessed by wolves poses no threat to wolves. Foothold traps for aquatic rodents will not be exposed and will be in deep enough water to minimize non-target catches. Snares and conibear traps will be partially or totally submerged in water. Multiple traps will not be used at the same location to avoid accidental capture of predators/scavengers attracted to animals in traps.

WS personnel responding to reports of predation on livestock and/or pets in Southern Ohio will be trained in methods used to differentiate wolf predation from predation by other canids. In the event that a depredation incident appears to be related to wolves, WS will contact the ODW regarding preferred management strategies to address the problem.

Risks of secondary poisoning from rodents which have eaten ZP bait is negligible because wolves are unlikely to occur in the locations where WS would use rodenticides, ZP is generally more toxic to rodents than carnivores and scavengers; 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980); 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle. The amount of ZP required to kill target rodents is not enough to kill most other predatory animals (Johnson and Fagerstone 1994). Additionally, ZP has a strong emetic action, and most predators and scavengers in lab tests have regurgitated contaminated tissue. Additional information on risks to non-target species from ZP is provided in Appendix B. Based on the above analysis, WS concludes that the proposed action will not adversely impact the state population of gray wolves.

Birds: The primary risks to T&E birds from the proposed action are the risk of primary toxicity to birds from the consumption of ZP treated grain, and the risks of secondary poisoning of birds which may consume rodents that have ingested rodenticide treated grain.

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). Use of rolled oats instead of whole grain also appears to reduce bird acceptance of bait. 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 ZP 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 ZP. Reduced impacts on birds have also been reported by Fellows et al. (1988), Tietjen and Matschke (1982) and Matschke et al. (1983). Based on the

above analysis, WS concludes that the proposed action will not adversely impact the state populations of T&E birds.

Reptiles: WS activities with the potential to impact T&E reptiles include removal of beaver dams in areas where wetland communities have developed and accidental capture in body gripping traps (e.g. conibear traps) set to capture aquatic rodents. As noted elsewhere in this section, instances where WS would remove dams from areas where wetland characteristics have been established are relatively rare. WS will consult with the ODW and USFWS prior to conducting beaver dam removal at sites with established wetlands and will implement any recommendations from these agencies for the protection of state and federally listed species.

As noted in Table 4-4, WS has captured non-target turtles during MDM activities. To date, WS has only captured common snapping and painted turtles, and there has been no incidental take of state-listed turtle species. WS is able to release most turtles with no harm. Of the seven non-target turtles WS has captured during the period of 2007-2012, WS was able to release all turtles. Given the low rate of occurrence for state-listed species and that most turtles can be released from the capture device, this alternative will not have an adverse impact on state T&E turtle populations.

Fish, Amphibians, Aquatic/Wetland Invertebrates and Plants: The only risk to species in this group from the proposed action is potential disturbance and/or loss of habitat associated with beaver dam removal. Almost all of WS' beaver dam removal work in Ohio involves removing recently built dams (usually one year old or less) to restore water movement in irrigation canals, under roadways, and in streams where dams result in undesirable property flooding. Recently flooded sites do not possess wetland characteristics, and wildlife habitat values are not the same as in established wetlands. Dam removal in these situations will be restoring the environmental status quo for the sites and will likely be beneficial to resident plants and animals. In the relatively rare instances when WS removes dams from an area where wetland community has developed in response to the presence of a beaver dam/pond (usually for trout stream restoration projects), WS will consult with the USFWS and ODW, as appropriate, to determine if T&E species are present at the site and the measures needed to protect T&E species. Many fish and aquatic invertebrates prefer clear gravel/sand bottoms and free-flowing water conditions. Beaver dam removals are likely to be beneficial to these species. WS will implement any recommendations for protective measures from these agencies. Based on this analysis and the proposed protective measures, this alternative will not adversely impact state or federally-listed fish, amphibians, aquatic/wetland organisms or plants.

T&E species that are federally and state listed (or proposed for listing) in Ohio are listed in the Appendix C. WS has determined that the proposed action would not adversely affect populations of state or federally listed T&E species. The ODW 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 (Carolyn Caldwell, Terrestrial Endangered Species & Wildlife Diversity Administrator, Wildlife Management and Research Group, ODW, letter to Andy Montoney, WS, December 19, 2012). The USFWS has concurred with WS' determination that the proposed

nonlethal and lethal mammal damage management activities in the Preferred Alternative are not likely to adversely affect the federally listed endangered and federal candidate species in Ohio (Letters from M. Knapp, PhD, Field Supervisor, USFWS Ecological Services, to Andy Montoney, WS, August 2 & November 16, 2012). Any actions taken under this alternative will be conducted in accordance with recommendations and reasonable and prudent measures from the USFWS for the protection of federally and state listed species.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

WS' efforts to protect rare, threatened or endangered species would not be as effective as the preferred alternative because WS would be unable to access lethal techniques if non-lethal techniques are ineffective. Lethal efforts to protect these species would have to be conducted by other natural resource management entities. Under this alternative, WS take of non-target animals would be less than that of the proposed action because no lethal control actions would be taken by WS. Non-target species are usually not affected by WS' non-lethal management methods, except for the occasional scaring from harassment devices. In these cases, affected non-target wildlife may temporarily leave the immediate vicinity of scaring, but would most likely return after conclusion of the action. Capture and release (e.g., for disease monitoring) and capture and relocate would be allowed under this alternative. There is the extremely remote chance that the capture devices could result in the death of a non-target animal. However, given that these devices would be applied with provisions to keep the target animal alive, the risks to non-target species are very low and would not result in adverse impacts on non-target species populations.

If mammal damage problems were not effectively resolved by non-lethal control methods, members of the public may resort to other means of lethal control such as the use of shooting or the use of pesticides. This could result in less experienced persons implementing control methods and could lead to greater risks to non-target wildlife than the proposed action. For example, shooting by persons not proficient at mammal identification could lead to killing of non-target mammals. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of chemical toxicants which could lead to unknown effects on local non-target species populations.

Effects on T&E Species: WS will not have any direct impact on T&E species. Risks to T&E species from increased private efforts to address damage management problems will vary depending upon the training and level of experience of the individual conducting the MDM. As stated above, frustrated individuals may resort to use of unsafe or illegal methods like poisons which may increase risks to species like the bald eagle and peregrine falcon. Risks to T&E species may be lower with this alternative than with Alternative 4 because people would have ready access to assistance with non-lethal MDM techniques. WS could advise individuals as to the potential presence of state and federally listed species in their area.

Alternative 4: No Federal WS Mammal Damage Management

Alternative 4 would not allow any WS MDM in the State; therefore WS would not take any non-target species under this alternative. The ODW or other natural resource management entities may have to allocate staff time and resources for projects to protect threatened, endangered and rare birds because WS could no longer assist with these programs. Private efforts to reduce or prevent depredations could increase which could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than under the proposed action. 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 impact local non-target species populations, including some 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.

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

4.1.3 Effects on Human Health and Safety

Alternative 1: Technical Assistance Only

Alternative 1 would not allow any direct operational MDM assistance by WS. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and leading to a greater risk than Alternative 2. However, because some of these private parties would be receiving advice and instruction from WS, concerns about human health risks from chemical MDM methods use should be less than under Alternative 4.

Hazards to humans and pets could be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate mammal damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets. Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under Alternative 2.

Risks to human safety from WS' use of firearms, traps, snares and pyrotechnics would not exist because WS would not be conducting direct damage management activities. However, WS would provide technical advice to those persons requesting assistance. Landowners/resource

managers could use information provided by WS or implement damage reduction methods without WS technical assistance. Hazards to humans and property could be greater under this alternative if personnel conducting MDM activities using non-chemical methods are poorly or improperly trained. Negative impacts to public safety resulting from the improper use of control methods should be less than Alternative 4 when WS technical advice is followed.

With WS technical assistance but no direct damage management, entities requesting MDM assistance for human health concerns would either take no action, which means the risk of human health problems would likely continue or increase in each situation as mammal numbers are maintained or increased, or implement WS recommendations for non-lethal and lethal control methods. Potential impacts would be variable depending upon the training and experience of the individuals conducting the MDM. Individuals or entities that implement the recommendations may lack the experience necessary to efficiently and effectively conduct an effective MDM program and risks could continue or increase. Therefore, the odds of successfully reducing wildlife risks to human health and safety may be similar to or lower than Alternative 2. The likelihood that individual efforts would reduce mammal conflicts would be higher under this alternative than Alternative 4 if people request and use WS technical assistance recommendations.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

An Integrated MDM strategy, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing human health and safety risks associated with the mammals addressed in this EA. Under this alternative, all legal MDM methods could possibly be implemented and recommended by WS. Efficacy of any given MDM method will vary depending on site specific conditions. Access to the full range of MDM methods results in the greatest possibility of alleviating risks to human health and safety by allowing WS specialists to pick the methods best suited to the particular situation.

Toxicants. The toxicants that could be used by WS under this alternative are described in detail in Appendix B and include ZP and gas cartridges. Gas cartridges and ZP are used in WS MDM programs in Ohio by WS personnel who are certified pesticide applicators, in accordance with label restrictions in a manner defined by application guidelines on the label. Chemical pesticides that have come into effect in recent years have undergone considerable environmental review through EPA and State registration processes, which means they have been found to present no unreasonable risk to the environment or human health and safety when used according to label directions. Therefore, MDM programs in Ohio where such chemicals are used are not expected to adversely affect public safety. There have been no observed symptoms of chronic poisoning due to ZP exposure in humans.

Other MDM Chemicals.
Drugs used in capturing, sedating, handling, and euthanizing wildlife for wildlife management purposes include ketamine hydrochloride, a mixture of tiletamine and zolazepam (Telazol), xylazine (Rompun), sodium pentabarbitol, potassium chloride, Yohimbine, antibiotics, and

others. WS would adhere to all applicable requirements of the AMDUCA to prevent any significant adverse impacts on human health with regard to this issue. Standard operating procedures for the use of drugs would include:

- All drugs used in capturing and handling wildlife would be under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and WS. As determined on a state-level basis by these veterinary authorities (as allowed by AMDUCA), wildlife damage management programs may choose to avoid capture and handling activities that utilize immobilizing drugs within a specified number of days prior to the hunting or trapping season for the target species to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. Animals that have been drugged and released would be ear tagged or otherwise marked to alert hunters and trappers that they should contact state officials before consuming the animal.

- Most drug administration would be scheduled to occur well before state controlled hunting/trapping seasons which would give the drug time to completely metabolize out of the animals' systems before they might be taken and consumed by humans. In some instances, animals collected for control purposes would be euthanized when they are captured within a certain specified time period prior to the legal hunting or trapping season to avoid the chance that they would be consumed as food while still potentially having immobilizing drugs in their systems.

- Activities involving the handling and administering drugs, drugs selected for use, animal marking systems, and the fate of any animals that must receive drugs at times during or close to scheduled hunting seasons would be coordinated with the ODW.

By following these procedures, the proposed action would avoid any significant impacts on human health with regard to this issue.

Non-chemical MDM methods that might raise safety concerns include shooting with firearms, use of traps and snares, and harassment with pyrotechnics. All WS personnel are trained in the safe and effective use of MDM techniques. The Ohio WS program has had no accidents involving the use of any of its non-chemical MDM techniques including firearms, pyrotechnics, traps, snares, or explosives in which any person was harmed. Standard operating procedures designed and implemented to avoid adverse effects on public and pet health and safety are described in Chapter 3.

Shooting and trapping are methods used by WS which pose minimal or no threat to pets and/or public health and safety. All firearm safety precautions are followed by WS when conducting MDM and WS complies with all laws and regulations governing the lawful use of firearms. Shooting is virtually 100% selective for target species and may be used in conjunction with spotlights. WS may use firearms to humanely euthanize animals caught in live traps. WS traps are strategically placed to minimize exposure to the public and pets. Appropriate signs are

posted on all properties where traps are set to alert the public of trap presence. Body grip (e.g., conibear type) traps used for beaver are restricted to water sets which further reduce threats to public and pet health and safety.

Firearms and firearm misuse are a cause of concern because of issues relating to public safety and accidental injury or death. To ensure safe use of firearms, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within three months of their appointment and a refresher course every two years afterwards (WS Directive 2.615). WS employees who use firearms as a condition of employment must comply with all applicable Federal State and local regulations including the Lautenberg Amendment which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. Therefore, no adverse effects on human safety from WS' use of these methods are expected.

In most cases, it is difficult to conclusively prove that mammals were responsible for transmission of individual human cases or outbreaks of mammal-borne diseases. However, the limited records of disease occurrence in Ohio do not necessarily mean absence of risk, but may indicate a lack of reliable research in this area. There are limited studies available on the occurrence and transmission of zoonotic diseases in wild mammals. Study of this issue is complicated by the fact that some disease-causing agents associated with wildlife, may also be contracted from other sources. WS works with cooperators on a case-by-case basis to assess the nature and magnitude of the wildlife conflict including providing information on the limitations about what we know regarding health risks associated with wild mammals. In most cases, the risk of contracting a disease from wild mammals is relatively low. It is the choice of the individual cooperator to tolerate the potential health risks or to seek to reduce those risks. Certain requesters of MDM service may consider even a low level of risk to be unacceptable. Many property owners/managers wish to eliminate risks before someone actually gets sick because of conditions at their site. In such cases, MDM, either by lethal or non-lethal means, would reduce the risk of mammal-borne disease transmission at the site for which MDM is requested.

In some situations the implementation of non-lethal controls such as netting barriers and harassment could actually increase the risk of human health problems at other sites by causing the mammals to move to other sites not previously affected. In such cases, lethal removal of the mammals may actually be the best alternative from the standpoint of overall human health concerns in the local area. If WS is providing direct damage management assistance in relocating mammals, coordination with local authorities would be conducted to assure they do not reestablish in other undesirable locations.

Aerial wildlife operations, like any other flying, could result in an accident. Wildlife Services' pilots and crewmembers are trained and experienced to recognize the circumstances that lead to accidents and have thousands of hours of flight time. The National Wildlife Services Aviation Program has increased its emphasis on safety, including funding for additional training, the establishment of a Wildlife Services Flight Training Center and annual recurring training for all pilots.

The National Transportation Safety Board (NTSB) has stated that aviation fuel is extremely volatile and will evaporate within a few hours or less to the point that even its odor cannot be detected (USDA 2005). Helicopters used for aerial wildlife operations carry less fuel than fixed-wing aircraft with 30 gallons the maximum for most helicopters. In some cases, little or none of the fuel would be spilled if an accident occurs. Thus, there should be little environmental hazard from un-ignited fuel spills.

For these reasons, the risk of ground fires or fuel/oil pollution from aviation accidents could be considered low. In addition, based on the history and experience of the program in aircraft accidents, it appears the risk of significant environmental damage from such accidents is exceedingly low.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

WS could only implement non-lethal methods such as harassment and exclusion devices and materials. Non-lethal methods could, however, include use and recommendation of repellents and could use capture and handling drugs for capture and release projects. Impacts from WS use of these chemicals would be similar to those described under the proposed action.

Excessive cost or ineffectiveness of non-lethal techniques could result in some entities rejecting WS' assistance and resorting to other means of MDM. Risks associated with non-WS use of toxicants will vary depending upon the training and experience of the individuals conducting the MDM. Such means could include illegal pesticide uses. Hazards to humans could be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used. Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the proposed alternative. Overall risks to human health and safety from this alternative are likely to be equal to or greater than Alternative 2.

Under this alternative, non-chemical MDM methods that might raise safety concerns include shooting with firearms when used as a harassment technique, cage traps, and harassment with pyrotechnics. Risks to human health and safety from use of firearms as a harassment technique under this alternative are similar to risks discussed for firearms use (harassment and lethal removal of target animals) under Alternative 2. As with Alternative 2, WS personnel would receive safety training on a periodic basis to keep them aware of safety concerns. Therefore, no adverse effects on human safety from WS' use of these methods are expected.

Some resource owners/managers may not feel that non-lethal techniques are adequate to resolve their wildlife conflict and may use lethal MDM methods without WS assistance. Risks to human safety from these actions will depend on the method selected and the experience and training of the individual using the technique.

Non-lethal methods may not be effective at or suitable for all situations. The efficacy of some techniques may be limited by habituation (the ability of an animal to become accustomed to and not respond to an otherwise frightening sight or sound). Other techniques like fencing may not

be suitable because of zoning, visual impacts on the site, or because they may adversely impact other non-injurious species. In some situations the implementation of non-lethal controls such as netting barriers and harassment could actually increase the risk of human health problems at other sites by causing the mammals to move to other sites not previously affected. However, when WS is providing direct damage management assistance in relocating mammals, coordination with local authorities would be conducted to minimize the risk of problem animals relocating to other undesirable areas.

Alternative 4: No Federal WS Mammal Damage Management

Private efforts to reduce or prevent damage would be expected to increase. Risks to human health and safety from chemical MDM methods will be variable depending upon the training and experience of the individual conducting the MDM. Hazards to humans and pets could be greater under this alternative if other chemicals that are less selective or that cause secondary poisoning are used or if chemicals are used improperly by inexperienced personnel. It is hypothetically possible that frustration caused by the inability to alleviate mammal damage could lead to illegal use of certain toxicants that could pose secondary poisoning hazards to pets. Some chemicals that could be used illegally could present greater risks of adverse effects on humans than those used under the current program alternative.

Non-WS personnel would be able to use pyrotechnics, traps, snares or firearms in MDM programs and this activity would likely occur to a greater extent in the absence of WS assistance. Hazards to humans and property could be greater under this alternative if personnel conducting MDM activities using non-chemical methods are poorly or improperly trained.

With no WS assistance, cooperators would be responsible for developing and implementing their own MDM program. Success of cooperator efforts to reduce or prevent risks to human health and safety from wildlife will depend on the training and experience of the individual conducting the MDM. If less experienced persons attempt to implement control methods, risks of not reducing mammal hazards could be greater than under the proposed action.

4.1.4 Impacts to Stakeholders, including Aesthetics

Alternative 1: Technical Assistance Only

Persons who have developed affectionate bonds with individual wild mammals would not be affected by WS' activities under this alternative because the individual animals would not be killed by WS. However, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the Proposed Action Alternative.

Wildlife Services would provide technical advice to those persons requesting assistance. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. When WS technical advice is requested and followed, impacts on those persons adversely affected by mammal damage should be less than

Alternative 4. However, some resource owner's efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods. Therefore, mammal damage management could take longer to execute and may be less effective under this alternative than the Proposed Action Alternative depending upon the skills and abilities of the person implementing MDM control methods.

Relocation of mammals through harassment, barriers, or habitat alteration can sometimes result in the mammals causing the same problems at the new location. If WS has only provided technical assistance to local residents or municipal authorities, coordination with local authorities to monitor the mammal's movements to assure the mammals do not reestablish in other undesirable locations might not be conducted, thereby increasing the potential of adverse effects to nearby property owners.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

Those who routinely view or feed individual animals would likely be disturbed by removal of such mammals under the current program. WS is aware of such concerns and takes these concerns into consideration when developing site-specific management plans. WS may be able to mitigate such concerns by leaving certain animals that have been identified by interested individuals.

Some members of the public have expressed opposition to the killing of any mammals during MDM activities. Under this Proposed Action Alternative, some lethal control of mammals would occur and these persons would be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular mammals that would be killed by WS' lethal control activities. Lethal control actions would generally be restricted to local sites and to small, unsubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would, therefore, continue to remain available for viewing by persons with that interest.

Damage to property would be expected to decrease under this alternative since all available damage management methods and strategies would be available for WS use and consideration.

Relocation or dispersal of mammals by harassment can sometimes result in the mammals causing the same or similar problems at the new location. If WS is providing direct damage management assistance in relocating such mammals, coordination with local authorities would be conducted to assure they do not re-establish in other undesirable locations.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, WS would not conduct any lethal MDM, but may conduct harassment of mammals that are causing damage. Some people who oppose lethal control of wildlife by the government, but are tolerant of government involvement in non-lethal wildlife damage

management would favor this alternative. Persons who have developed affectionate bonds with individual wild mammals might oppose dispersal or translocation of certain mammals. WS may be able to mitigate such concerns by leaving certain animals that have been identified by interested individuals. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, which means the effects would be similar to the Proposed Action Alternative.

Under this alternative, WS would be restricted to implementing and recommending only non-lethal methods in providing assistance with mammal damage problems. While this may improve the use of non-lethal methods over that which might be expected under Alternative 4, the efficacy of non-lethal methods can be quite variable. If non-lethal methods were ineffective at reducing damage, WS would not be able to provide any other type of assistance. In these situations, mammal damage would likely continue to increase unless resource owners implemented an effective MDM program in the absence of WS. Resource owners' efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods. Therefore, mammal damage management could take longer to execute and may be less effective under this alternative than the Proposed Action Alternative depending upon the skills and abilities of the person implementing MDM control methods.

Assuming property owners would choose to allow and pay for the implementation of non-lethal methods, this alternative could result in mammals relocating to other sites where they could cause or aggravate similar problems for other property owners. Thus, this alternative could result in more property owners experiencing adverse effects on the aesthetic values of their properties than the Proposed Action Alternative.

Relocation or dispersal of mammals by harassment can sometimes result in the mammals causing the same or similar problems at the new location. If WS is providing direct damage management assistance in relocating such mammals, coordination with local authorities would be conducted to assure they do not re-establish in other undesirable locations.

Alternative 4: No Federal WS Mammal Damage Management

Those in opposition of any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild mammals would not be affected by WS' activities under this alternative. However, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the Proposed Action Alternative.

Mammal damage would likely continue to increase unless resource owners implemented an effective MDM program in the absence of WS. Resource owners could implement their own damage reduction program without WS assistance. Resource owners' efforts to reduce or prevent conflicts could result in less experienced persons implementing control methods. Therefore, mammal damage management could take longer to execute and may be less effective

under this alternative than the Proposed Action Alternative depending upon the skills and abilities of the person implementing MDM control methods.

Relocation of mammals through harassment, barriers, or habitat alteration can sometimes result in the mammals causing the same problems at the new location. Coordination of relocation and dispersal activities by local residents with local authorities to monitor the mammals' movements to assure the mammals do not re-establish in other undesirable locations might not be conducted, thereby increasing the potential of adverse effects to nearby property owners.

4.1.5 Humaneness and Animal Welfare Concerns of Methods Used

Alternative 1: Technical Assistance Only

Under this alternative, WS would provide self-help advice only. Lethal methods viewed as inhumane by some persons would not be used by WS. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. Many of the methods considered inhumane by some individuals and groups might still be used by resource owners. Overall impacts should be less than Alternative 4 when WS technical advice is requested and followed.

Alternative 2: Implement an Integrated Mammal Damage Management Program (Proposed Action/No Action)

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

WS uses EPA registered and approved pesticides, such as ZP and gas cartridges to manage damage caused by some mammals in Ohio. Some individuals consider the use of such chemicals to be inhumane. WS personnel are experienced, professional and humane in their use of management methods. Under this alternative, mammals would be killed by experienced WS personnel using the best and most appropriate method(s) available. Some people may perceive these methods as inhumane because they oppose all lethal methods of damage management.

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.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Under this alternative, lethal methods, viewed as inhumane by some persons, would not be used by WS. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, resulting in impacts similar to the Proposed Action Alternative.

Alternative 4: No Federal WS Mammal Damage Management

Under this alternative, lethal methods, viewed as inhumane by some persons, would not be used by WS. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct MDM activities similar to those that would no longer be conducted by WS, resulting in impacts similar to the Proposed Action Alternative.

4.1.6 Effects on Wetlands

Alternative 1: Technical Assistance Only

Under this alternative, WS would not conduct MDM activities and would have no impact on wetlands. Under this alternative, beaver dam breaching and removal needs would be met by private, state, or local government entities. Some beaver impounded areas that WS would advise against draining might be drained under private or local government management, which could have adverse effects on wetland habitats in limited circumstances.

Alternative 2: Implement an Integrated Mammal Damage Management Program (Proposed Action/No Action)

Under this alternative, beaver dams could be breached or removed by hand or with explosives for the purpose of returning streams, channels, dikes, culverts, and irrigation canals to their original drainage pattern. Beaver dams are removed according to Section 404 of the Clean Water Act (CWA). WS breaches/removes most beaver dams because of flooding in areas such as yards, parks, roads, railroads, timberlands, croplands, pastures, and other types of property or resources that were not previously flooded. Recently flooded sites do not possess wetland characteristics, and wildlife habitat values are not the same as established wetlands. Dam removal in these situations will be restoring the status quo for these sites and will likely be beneficial to most resident plants and animals. In the relatively rare instances when WS removes dams from areas where wetland communities have developed, WS uses the procedures to assure compliance with pertinent laws and regulations. WS would also consult with the USFWS and ODW regarding potential risks to state and federally listed T&E species and would implement recommendations from these agencies in order to minimize risks to T&E species. For these reasons WS beaver dam removal/breaching activities should have minimal impact on wetlands.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

Beaver created impoundments could be breached/removed by hand, with machinery, or with explosives by WS for the purpose of returning streams, channels, ditches, and irrigation canals to the original drainage under this alternative. Overall impacts would be similar to Alternative 2. Unless beaver are removed from the site, the duration of the impact is likely to be less than with Alternative 2 because beaver are likely to rapidly rebuild the dam.

Alternative 4: No Federal WS Mammal Damage Management

WS will not conduct MDM activities and would have no impact on wetlands. Under this alternative, beaver dam breaching and removal needs would be met by private, state, or local government entities. Some beaver impounded areas that WS would advise against draining might be drained under private or local government management, which could have adverse effects on wetland habitats in limited circumstances.

4.2 CUMULATIVE IMPACTS

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

Under Alternatives 1, 2 and 3, WS would, to varying extents, address damage associated with mammals in a number of situations throughout the State. The WS MDM program would be the primary federal program with MDM responsibilities; however, some state and local government agencies may conduct MDM activities in Ohio as well. Through ongoing coordination with these agencies, WS is aware of such MDM activities and may provide technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with such agencies in the same area, but may conduct MDM activities at adjacent sites within the same time frame. In addition, commercial pest control companies may conduct MDM activities in the same area. The potential cumulative impacts analyzed below could occur either as a result of WS MDM program activities over time, or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

Issue 1 - Effects on Target Mammal Species

As shown in Section 4.1.1, MDM methods used or recommended by the WS program in Ohio will have no cumulative adverse effects on target and non-target wildlife populations. WS limited lethal take of target mammal species is anticipated to have minimal impacts on target mammal populations in Ohio. When control actions are implemented by WS the potential lethal take of non-target wildlife species is expected to be minimal and will not adversely affect populations of these species.

Issue 2 - Effects on Other Wildlife Species, including Threatened and Endangered Species

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

The use of firearms, immobilizing chemicals and euthanasia chemicals are essentially selective for target species since identification of an individual is made prior to the application of the method. Both euthanasia and immobilizing drugs are applied through direct injection to target wildlife. Therefore, the use of those methods would not affect non-target species.

The methods described in Appendix B of the EA all have a high level of selectivity and can be employed using SOP's to ensure minimal impacts to non-targets species. Based on the methods available to resolve mammal damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those species' populations would occur. Therefore, take of non-targets would not cumulatively affect the populations of non-target species. WS has reviewed the threatened and endangered species listed by the USFWS and the ODW and has determined that activities proposed by WS would have no effect on threatened and endangered species. WS has also determined that mammal damage management activities proposed in this supplement would have no effect on threatened and endangered species and species of concern that are listed by the ODW. Cumulative impacts would be minimal on non-targets from any of the alternatives discussed.

Issue 3 - Effects on Human Health and Safety

<u>Non-Chemical Methods</u>
All non-chemical methods described in Appendix B of this EA are used within a limited time frame, are not residual, and do not possess properties capable of inducing cumulative adverse impacts on human health and safety. All non-chemical methods are used after careful consideration of the safety of those employing methods and to the public. All capture methods are employed where human activity is minimal and warning signs are placed in conspicuous areas, when appropriate, to ensure the safety of the public. SOP's also ensure the safety of the public from those methods used to capture or take wildlife. Firearms used to alleviate or prevent damage, though hazards do exist, are employed to ensure the safety of personnel and the public.

Personnel employing non-chemical methods would continue to be trained to be proficient in the

use of those methods to ensure safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods would not cumulatively affect human safety.

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 of the EA, the lethal removal of mammal species with firearms by WS to alleviate damage or threats would occur using a handgun, rifle, or shotgun. In an ecological risk assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996). Hunt et al. (2009) also found that deer killed with rifles using lead bullets might pose a risk of lead exposure to scavengers from ingestion of lead fragments in the carcass.

To reduce risks to human safety and property damage from bullets passing through mammal species, the use of firearms is applied in such a way (e.g., caliber, bullet weight, distance) to ensure the bullet does not pass through. When using firearms, the retrieval of carcasses for proper disposal is highly likely. With risks of lead exposure occurring primarily from ingestion of shot and bullet fragments, the retrieval and proper disposal of carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead.

However, deposition of lead into soil could occur if, during the use of firearms, the projectile(s) pass through, if misses occur, or if the carcass is not retrieved. In general, hunting tends to spread lead over wide areas and at low concentrations (Craig et al. 1999). 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, other concerns are that lead from bullets or shot deposited in soil from shooting activities could lead to contamination of water, either ground water or surface water, from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "transport" readily in surface water when soils were neutral or slightly alkaline in pH (i.e., not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "fall zones," the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot where it was believed the lead contamination was due to runoff from the parking lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. Muscle samples from two species of fish collected in the water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the "action level" of 15 parts per billion as defined by the EPA (i.e., requiring action to treat the water to remove lead). The study found that the dissolution (i.e., capability of dissolving in water) of lead

declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape is reduced once the bullets and shot form crusty lead oxide deposits on their surfaces, which serves to naturally further reduce the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS' activities using firearms, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent.

WS' assistance with removing target mammal species would not be additive to the environmental status quo since those mammals removed by WS using firearms could be lethally removed by the landowners or other entities receiving the depredation permit 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 activities. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that mammals are lethally removed in a humane manner 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 carcasses would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures carcasses are removed from the environment to prevent the ingestion of lead by scavengers. Based on current information, the risks associated with lead bullets or shot that are deposited into the environment from WS' activities due to misses, the bullet or shot passing through the carcass, or from carcasses that may be irretrievable, would be below any level that would pose any risk from exposure or significant contamination of water.

Chemical Methods

Chemical methods available for use under the proposed action are repellents, immobilizing drugs, and euthanizing drugs described in Appendix B. Immobilizing drugs are administered to target individuals using devices or methods that ensure the identification of the target animal. The immobilizing drugs require injection of the drug directly into an animal. Injection would occur through hand injection via a syringe, by jab stick, or by a dart fired from a projector that mechanically injects the drug into the animal upon impact. Immobilizing drugs temporarily sedate an animal to minimize stress of handling and to reduce the risks to human safety. Immobilized animals may also be euthanized using a drug described in Appendix B. Euthanasia drugs would only be administered after the animal has been properly restrained and immobilized and would occur through direct injection. Wildlife Services' personnel are required to attend training courses and to be certified in the use of immobilizing and euthanizing drugs to ensure proper care and handling occurs, to ensure the proper doses are administered, and to ensure human safety under WS Directive 2.430. Wildlife Services' personnel would continue to be trained in the proper handling and administering of immobilizing and euthanasia drugs to ensure human safety.

Direct application of chemical methods to target species would ensure that there are no cumulative impacts to human safety. All chemical methods would be tracked and recorded to

ensure proper accounting of used and unused chemicals occurs. All chemicals would be stored and transported according to Food and Drug Administration and Drug Enforcement Administration regulations, including the directives of WS. The amount of chemicals used or stored by WS would be minimal to ensure human safety.

Repellents available for use to disperse mammals from areas of application must be registered with the EPA according to the Federal Insecticide, Fungicide, Rodenticide Act. Many of the repellents currently available for use have active ingredients that are naturally occurring and are generally regarded as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents are applied according to label requirements, no adverse effects to human safety are expected.

The M-44 (sodium cyanide ejector mechanism) is a lethal chemical control method which may be used. There has been some concern expressed by members of the public that unknown but significant risks to human health may exist from M-44's used for predator management.

Currently, the M-44 device is not registered for use in Ohio, but may be used in future years for livestock protection by registered applicators. This chemical has been extensively researched and evaluated for registration with EPA to control canine predation on livestock and for protecting threatened and endangered species. No WS employee has ever been killed by an M-44 device in 55 years of use by WS.

Factors which virtually eliminate any risk of public health or safety problems from use of M-44's include:

- Follow M-44 label directions including the 26 use restrictions required by EPA and directions in the Predator Management Training Manual (Lowney 1996) or a similar publication.
- All employees using M-44's carry amyl nitrate antidote kits.
- Poison control centers would be notified about use of sodium cyanide in Ohio.
- Sodium cyanide rapidly breaks down when exposed to the environment.
- Because sodium cyanide rapidly breaks down when exposed to the environment, persons handling exposed dead animals would not be exposed.
- Sodium cyanide registered by WS has an orange marking dye which would indicate exposure of sodium cyanide if found on clothing, skin, or fur.
- The maximum application rates are extremely low (less than 12 grams per square mile) (see M-44 restricted use pesticide label).
- A human would need to orally ingest or inhale sodium cyanide from the M-44 to be harmed or die. This would mean pulling up on an M-44 embedded in the ground, the head of which is baited with rancid meat paste. The sodium cyanide would then have to be ejected into the mouth or face to receive this chemical or its metabolites into his/her system. This is highly unlikely to occur.
- M-44's are only used within fenced pastures and fields typically grazed by livestock.
- Warning signs are posted at entryways of the farm and within 25 feet of each M- 44.
- Property owners adjacent to the property where M-44's are to be placed are notified.

- WS personnel would be certified in Ohio as restricted-use pesticide applicators.

The above analysis indicates that human health risks from M-44 use would be virtually nonexistent.

The Livestock Protection Collar (LPC) is another chemical method used in Ohio by our registered applicators. Appendix B provides more detailed information on this chemical. The LPC consists of a rubber collar with two rubber reservoirs (bladders), each of which contains 15 milliliters (ml) of a 1-percent solution of sodium fluoroacetate. The LPC has Velcro straps for attachment around the neck of a sheep or goat with the reservoirs positioned just behind the jaw. Two collar sizes are available to accommodate various size livestock.

Coyotes typically attack sheep and goats by biting them on the throat and crushing the larynx, causing suffocation. Coyotes that attack collared sheep generally puncture the collar with their teeth (in 75% or more of attacks) and receive a lethal oral dose of toxicant. There has been limited use of LPC's in the Eastern U.S.; for example in Virginia during FY 1996-2001, 375 ml of sodium fluoroacetate from LPC's was exposed from puncturing by coyotes. Ohio has used 45 ml during FY 2004-2012. Factors which virtually eliminate any risks of public health or safety problems from use of LPC's include:

- The toxicant (sodium fluoroacetate) is contained within rubber bladders worn by livestock which makes it unlikely the public will come into contact with LPC's.
- A human would need to ingest liquid toxicant from one of the rubber bladders to have any chance of receiving the chemical into his/her system, which is highly unlikely to occur.
- Secondary hazard studies with mammals and birds have shown that there is no hazard of secondary poisoning.
- Warning signs are placed at the entrance of farms where sheep or goats collared with LPC's are located within fenced pastures.
- Warning labels are attached to all LPC's informing a person about the toxic nature of the contents.
- WS personnel are certified in Ohio as restricted-use pesticide applicators.
- There is a yellow dye mixed with the sodium fluoroacetate in the LPC which serves as a warning that the LPC has been punctured and precautionary measures such as wearing rubber gloves need to be taken.
- WS personnel follow label instructions and directions in the Predator Management Training Manual (Lowney 1996) or a similar publication.
- LPC devices are checked daily by the cooperator and weekly by the applicator to ensure proper fit and that they were unbroken.

The above analysis indicates that human health risks from sodium fluoroacetate (LPC) use would be virtually nonexistent.

Issue 4 - Impacts to Stakeholders, including Aesthetics

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

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

Wildlife Services has no direct impact on the status of the population of mammalian species since all take by WS occurs at the discretion of the ODW. Since those landowners or persons seeking assistance could remove those species from areas where damage is occurring through depredation permits issued by the ODW, WS' involvement would have no effect on the aesthetic value of those species in the area where damage was occurring. When a property owner and/or manager that is experiencing damage caused by those target species, the removal of those species by a depredation permit would likely occur whether WS was involved with taking those species or not.

Therefore, the activities of WS are not expected to have any cumulative adverse effects on this element of the human environment if occurring at the request of a property owner and/or manager and a permit has been issued by the ODW who are responsible for regulating a resident wildlife species.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Used

Wildlife Services continues to implement SOP's to ensure methods are employed as humanely as possible. WS continues to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by mammals. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing methods.

Issue 6 – Effects of Beaver Removal and Dam Manipulation on the Status of Wetlands in the State

The intent of most dam breaching is not to drain established wetlands. With few exceptions, requests from public and private individuals and entities that WS receives involve dam breaching

to return an area back to its pre-existing condition within a few years after the dam was created. If the area does not have hydric soils, it usually takes many years for them to develop and a wetland to become established. This often takes greater than five years as recognized by the Swampbuster provisions. Most beaver dam removal by WS is either exempt from regulation under Section 404 of the Clean Water Act (CWA) as stated in 33 CFR Part 323 or may be authorized under the United States Army Corps of Engineers Nationwide Permit System in 33 CFR Part 330.

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

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

Therefore, the activities of WS to manage beaver would not be expected to have any cumulative adverse effects on the status of wetlands in Ohio if occurring at the request of a property owner and/or manager.

SUMMARY

No significant cumulative environmental impacts are expected from any of the four Alternatives. Under the Proposed Action, the lethal removal of mammals by WS would not have significant impacts on overall target mammal populations in Ohio, but some short-term local reductions may occur. No risk to public safety is expected when WS' proposals are provided and accepted by requesting individuals in Alternative 2 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, 2 and 3 conduct their own MDM activities, and when no WS assistance is provided in Alternative 4. In all four 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' participation in MDM activities on public and private lands within the state of Ohio, the analysis in this EA indicates that WS Integrated MDM program will not result in significant cumulative adverse impacts on the quality of the human environment. Table 4-5 summarizes the expected impact of each of the alternatives on each of the issues.

Table 4-5. Summary of Potential Impacts.

Issue	Alternative 1 Technical Assistance Only	Alternative 2 Integrated Mammal Damage Management Program (Proposed Action/No Action)	Alternative 3 Non-lethal MDM Only by WS	Alternative 4 No Federal WS MDM Program
1. Target Mammal Species Effects	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel; variable but likely would not significantly affect local or state populations.	Low effect - reductions in local target mammal numbers; would not significantly affect local or state populations	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel variable but likely would not significantly affect local or state populations.	No effect by WS. Low effect - reductions in local target mammal numbers by non-WS personnel variable but likely would not significantly affect local or state populations.
2. Effects on Other Wildlife Species, Including T&E Species	No effect by WS. Impacts by non-WS personnel would be variable. WS would not provide operational assistance with T&E species protection	Low effect - methods used by WS would be highly selective with very little risk to non-target species. WS would provide operational assistance with T&E species protection	Low effect - methods used by WS would be highly selective with very little risk to non-target species. WS only able to provide limited operational assistance with T&E species protection.	No effect by WS. Impacts by non-WS personnel would be variable. WS would not provide operational assistance with T&E species protection

3. Human Health and Safety Effects	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.	The proposed action has the greatest potential of successfully reducing this risk. Low risk from methods used by WS.	Low risk of injuries from methods used by WS. WS less likely to resolve risks associated with animals than with Alt 2. Efforts by non-WS personnel to use lethal MDM techniques could result in less experienced persons implementing control methods, a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater risk of injuries and greater potential of not reducing mammal damage than under the proposed action.
4a. Aesthetic Values of Wild Mammal Species and Human Affectionate Bonds	Low to moderate effect. Local mammal numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse effect on overall state target mammal populations.	Low to moderate effect at local levels; Some local populations may be reduced; WS mammal damage management activities do not adversely affect overall state target mammal populations.	Low to moderate effect. Local mammal numbers in damage situations would remain high or possibly increase when non-lethal methods are ineffective unless non-WS personnel successfully implement lethal methods; no adverse effect on state target mammal populations.	Low to moderate effect. Local mammal numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse effect on overall state target mammal populations.

4b. Aesthetic Values of Property Damaged by Mammals	Mammal damage may not be reduced to acceptable levels; mammal may move to other sites which can create aesthetic damage problems at new sites.	Low effect - mammal damage problems most likely to be resolved without creating or moving problems elsewhere.	Mammal damage may not be reduced to acceptable levels; mammals may move to other sites which can create aesthetic damage problems at new sites.	High effect - mammal problems less likely to be resolved without WS involvement. Mammals may move to other sites which can create aesthetic damage problems at new sites
5. Humaneness and Animal Welfare Concerns of Methods Used	No effect by WS. Impacts by non-WS personnel would be variable.	Impact by WS low to moderate effect - methods viewed by some people as inhumane would be used by WS.	Impact by WS Lower effect than Alt. 2 since only non-lethal methods would be used by WS. Impacts by non-WS personnel would be variable.	No effect by WS. Impacts by non-WS personnel would be variable.

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APPENDIX A

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APPENDIX B

MAMMAL DAMAGE MANAGEMENT METHODS

Resource owners and government agencies use a variety of techniques as part of integrated mammal damage management programs. All lethal and non-lethal methods have limitations based on costs, logistics, practicality, or effectiveness. There are also regulatory constraints on the availability and use of some MDM techniques. Mammal damage management methods currently available to the Ohio WS program are described here. If other methods are proven effective and legal to use in Ohio, they could be incorporated into the Ohio WS program, pursuant to permits, other authorizations, agreements with landowners, NEPA compliance, and other laws, regulations, and policies. Details on State restrictions regarding the use of some WDM methods are provided in Section 1.8.4

NONLETHAL METHODS-NONCHEMICAL

Cultural Methods and Habitat Management includes the application of practices which seek to minimize exposure of the protected resource to damaging animals through processes other than exclusion. They may include animal husbandry practices such as employing guard dogs, herders, shed lambing, carcass removal, or pasture selection. Strategies may also include minimizing cover where damaging mammals might hide, manipulating the surrounding environment to deter animals from entering a protected area, removing trees along stream banks to discourage the presence of beavers, removal of trees from around buildings to reduce access by squirrels and raccoons, or planting lure crops on fringes of protected crops. Continual destruction of beaver dams and removal of dam construction materials on a daily basis will sometimes cause beavers to move to other locations, although this strategy can be far more expensive than removing beavers in conjunction with dam removal. Water control devices such as the 3-log drain (Roblee 1983), the T-culvert guard (Roblee 1987), wire mesh culvert (Roblee 1983), and the Clemson beaver pond leveler (Miller and Yarrow 1994) can sometimes be used to control the water in beaver ponds to desirable levels that do not cause damage. Use of these devices is very limited among private landowners. Such methods have variable results and rarely provide acceptable levels of control unless used in an integrated program with other strategies. 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 and opossums are a problem, making trash and garbage unavailable and removing all pet food from outside during nighttime hours can reduce their presence. If tree squirrels are damaging property or causing a nuisance, care in preventing them from obtaining bird seed left in bird feeders can often greatly reduce their presence. This may mean hanging bird feeders by thin wire from tree limbs, or constructing mounting poles which cannot be climbed by these animals.

Animal Behavior Modification. This refers to tactics that deter or repel damaging mammals and thus, reduce damage to the protected resource. These techniques are usually aimed at

causing target animals to respond by fleeing from the site or remaining at a distance. They usually employ extreme noise or visual stimuli (e.g., flashing lights). Unfortunately many of these techniques are only effective for a short time before animals habituate (i.e., learn there is not a real threat; Conover 1982). Combining frightening stimuli and regularly changing the location, source and type of stimuli can extend the protective period of non-lethal methods. Using motion activated systems instead of systems which are activated on regular intervals may also extend the effective period for a frightening devices. Devices used to modify behavior in mammals include: electronic guards (siren/strobe-light devices), propane exploders, pyrotechnics, laser lights, and human effigies.

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

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

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

Animal Capture Devices

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

Foothold traps are traps that come in a variety of sizes that allows the traps to be species specific to some degree. These traps can be set on land or in water. They are made of steel with springs that close the jaws of the trap around the foot and leg of the target species. These traps may have steel or padded jaws, which hold the animal.

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 generally 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. Cage traps can range from the extremely small, intended for the capture of rodents and other small mammals to the large corral/panel traps used to live-capture feral hogs.

Hancock traps (suitcase/basket type cage traps) are designed to live-capture beaver. This type of trap is constructed of a metal frame covered in chain-link fence that is hinged with springs. Trap appearance is similar to a large suitcase when closed. When set, the trap is opened to allow an animal to enter, and when tripped the sides close around the animal.

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

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

Snares are traps made of light cable with a locking device, and are used to catch small and medium sized mammals. The cable is placed in the path of an animal in the form of a loop.

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

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

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

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

NON-LETHAL METHODS CHEMICAL

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

Telazol (tiletamine) 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).

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.

Repellents, such as Anthraquinone and Methyl Anthranilate, are usually naturally occurring substances or chemicals formulated to be distasteful or to elicit pain or discomfort for target animals when they are smelled, tasted, or contacted. Many repellents are commercially available for mammals, and are registered primarily for herbivores such as rodents and deer. Repellents are not available for many species which may present damage problems, such as some predators

or furbearing species. Repellents are variably effective and depend to a great extent on the resource to be protected, time and length of application, and sensitivity of the species causing damage. Acceptable levels of damage control are usually not realized unless repellents are used in conjunction with other techniques, as part of an integrated damage management program. In Ohio, repellents must be registered with the ODA.

LETHAL METHODS - MECHANICAL

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

Conibear (Body Gripping) Traps are the steel framed traps used to capture and quickly kill mammals, especially aquatic species. These traps come in a variety of sizes and may be used on land or in the water depending on trap size and state and local laws. The traps are made of two steel square frames that are hinged on two sides and have one or two springs. State restrictions on the use of conibear traps are provided in Section 1501: 31-15-09 of Ohio Administrative Code.

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. 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 efficiently 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. Firearm use may be a public concern because of issues relating to safety and misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within three months of their appointment and a refresher course every two years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to meet criteria contained in the Lautenberg Amendment which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. WS activities where shooting is used include, but are not limited to, take of mammals in damage situations pursuant to ODW permits.

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

Snap traps are used to remove small rodents. The trap treadle is baited with peanut butter or

other taste attractants and attached near the damage area. These traps pose no imminent danger to pets or the public.

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).

Aerial shooting or aerial hunting (shooting from an aircraft) is a commonly used method. Aerial hunting is species-specific and can be used for immediate control to reduce swine populations if weather, terrain, and cover conditions are favorable. Fixed-wing aircraft are most frequently used in flat and gently rolling terrain whereas helicopters, with better maneuverability, have greater utility and are safer over rugged terrain and timbered areas. In broken timber or deciduous cover, aerial hunting is more effective in winter when snow cover improves visibility and leaves have fallen. The WS program aircraft-use policy helps ensure that aerial hunting is conducted in a safe and environmentally sound manner, in accordance with federal and state laws. Pilots and aircraft must be certified under established WS program procedures and only properly trained WS employees are approved as gunners.

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the FIFRA administered by the EPA and ODA. WS personnel that use restricted-use chemical methods are certified as pesticide applicators by ODA and are required to adhere to all certification requirements set forth in FIFRA and Ohio pesticide control laws and regulations. Chemicals are only used on private or public sites with authorization from the property owner/manager.

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.

Zinc Phosphide is a toxicant used to kill rodents, lagomorphs and nutria. It is two to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Hill and Carpenter 1983, Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, and Johnson and Fagerstone 1994). This is because: 1) 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Matschke unpubl. as cited in Hegdal et al. 1980), 2) 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle, 3) the amount of zinc phosphide required to kill target rodents is not enough to kill most

other predatory animals that consume prairie dog tissue (Johnson and Fagerstone 1994).

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

In addition, zinc phosphide has a strong emetic action (i.e., causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Johnson and Fagerstone 1994). Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (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 six non-target rodent populations. They determined that no differences were observed from pretreatment until after treatment in populations of eastern cottontail rabbits (*Sylvilagus floridanus*) and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by non-target wildlife can occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse (*Peromyscus maniculatus*) populations in areas treated with zinc phosphide, however the effect was not statistically significant because of high variability in densities and the reduction was not long-term (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 non-target populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because: 1) poison grain remaining for their consumption was low (*i.e.*, bait was accepted by prairie dogs before larks could consume it), 2) birds have an

aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide. Reduced impacts on birds have also been reported by Tietjen and Matschke (1982). Deisch et al. (1989) reported on the effect zinc phosphide has on invertebrates. They determined that zinc phosphide bait reduced ant densities, however, spider mites, crickets, wolf spiders, ground beetles, darkling beetles and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Desich 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the insect 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).

Gas Cartridges are incendiary devices composed of carbon and sodium nitrate. When ignited and placed in the target animal's burrow, the resultant carbon monoxide and other gases cause asphyxiation. WS will not use gas cartridges in areas where State and Federally listed species may be in burrows with the target animal

Livestock Protection Collars are registered as a toxic collar with the EPA (Reg. No. 56228-22) and is registered for use on sheep or goats to kill depredating coyotes. The LPC consists of a rubber collar with two rubber reservoirs, each of which contains 15 milliliters of a 1-percent solution of sodium fluoroacetate (Compound 1080). The LPC has Velcro straps for attachment around the neck of a sheep or goat with the reservoirs positioned just behind the jaw. Two collar sizes are available to accommodate various size livestock.

Coyotes typically attack sheep and goats by biting them on the throat and crushing the larynx, causing suffocation. Coyotes that attack collared sheep generally puncture the collar with their teeth (in 75% or more of attacks) and receive a lethal oral dose of toxicant.

Use of the LPC involves the establishment of a "target flock" of 20-50 collared lambs and their ewes. These animals are placed in a high risk pasture where recent coyote attacks have occurred. Other (uncollared) livestock on the farm are moved to a safe area or are penned until predation stops.

The greatest advantage of the LPC is its selectivity. Only coyotes causing damage are killed. Disadvantages of the collar include the death of some collared livestock by coyotes, time and cost of certification required to use collars, potential hazards associated with the toxicant under field conditions, expense of collaring and monitoring target animals, mandatory record keeping, and management efforts needed to protect livestock displaced from the target flock's location. Numerous restrictions apply to the use of LPC's and are specified in the EPA approved LPC technical bulletin which is part of the restricted use pesticide label.

The **M-44 sodium cyanide device** is a spring-activated ejector device developed specifically to kill coyotes, although it is also registered with the EPA (EPA Reg No. 56228-15) to kill red foxes and feral dogs. The M-44 consists of a capsule holder wrapped in an absorbent material, an ejector mechanism, a capsule containing about 0.9 grams of a powdered sodium cyanide mixture, a fluorescent marker, and a 6-7 inch hollow stake. To set an M-44, a suitable location is found,

the hollow stake is driven into the ground, and the ejector unit is cocked and fastened into the stake by a slip ring. The wrapped capsule holder containing the cyanide capsule is then screwed onto the ejector unit and a coyote attractant is applied to the capsule holder. A canine attracted to the bait will try to bite and pick up the baited capsule holder. When the M-44 capsule holder is pulled, the spring-activated plunger propels sodium cyanide into the animal's mouth, resulting in a quick death. Coyotes killed by M-44's present no secondary poisoning risks, thus animals which may feed on a predator killed by an M-44 will be unaffected. Bilingual (English-Spanish) warning signs are posted at major entries into the area where M-44's are placed, and another bilingual warning sign is placed within 25 feet of each M-44 to warn of each device's presence.

The M-44 is very selective for canids because of the attractants used and because the device is triggered by pulling upward. Connolly (1988), in an analysis of M-44 use by the WS program from 1976-1986, documented about a 99% selectivity rate for target species (excluding skunks) in Nebraska. Domestic dogs are susceptible to M-44s, and this limits the areas where the devices can be safely used (see SOPs in Chapter 3). In addition, the 26 EPA use restrictions preclude the use of M-44's in areas where they may pose a danger to T&E species. The M-44 can be used effectively during winter months when foothold traps are difficult to keep in operation and M-44's are typically more selective for target canid species than foothold traps.
M-44's are used for corrective and preventive damage management on all land classes where authorized. Currently, M-44's are not registered for use in Ohio, but may be at a later date.

DRC-1339: The inherent safety features of DRC-1339 use that preclude or minimize hazards to mammals and plants are described in Appendix B. Although it is possible that some non-target birds may be unknowingly killed by use of DRC-1339, the method of application is designed to minimize or eliminate that risk. For example, DRC-1339 treated bait is only applied after a period of pre-baiting with untreated bait material and when non-target birds are not observed coming to feed at the site. While every precaution is taken to safeguard against taking non-target species, at times changes in local animal movement patterns and other unanticipated events could result in the incidental take of unintended species. These occurrences are rare and should not affect the overall populations of any species under the current program.

Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Risks to non-target birds are primarily limited through bait placement to avoid access by non-target birds. Pre-baiting observation periods are used to ascertain risks to non-target species and application locations are adjusted to minimize risk to non-target species. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to 2 to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days, were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected.

Anticoagulant Rodent Baits could be used in bait stations in and around airport structures. The use and proper placement of bait stations and will minimize the likelihood that the bait will be consumed by non-target species. There may also be secondary hazards from anticoagulant baits.

These risks are reduced somewhat by the fact that the predator scavenger species will usually need exposure to multiple carcasses over a period of days. Areas where anticoagulants are used will be monitored and carcasses picked up and disposed of in accordance with label directions. Risks to scavengers are also minimized by continual efforts to reduce overall wildlife activity at the airport. As already stated, WS would consult with ODNR before applying rodenticides at airports in order to confirm that no state-listed threatened or endangered rodents would be harmed in the process.

APPENDIX C

STATE AND FEDERALLY-LISTED THREATENED AND ENDANGERED SPECIES, AND SPECIES OF CONCERN IN OHIO

E – State Endangered, T – State Threatened, C – State Species of Concern * Federal Threatened, **Federal Endangered, *** Federal Candidate, ****Federal Species of Concern

PLANTS

Runnining Buffalo Clover *Trifolium stoloniferum* (**)
Lakeside Daisy *Hymenoxys herbacea* (*)
Northern Monkshood *Aconitum noveboracense* (*)
Eastern Prairie Fringed Orchid *Platanthera leucophaea* (*)
Virginia Spiraea *Spiraea virginiana* (*)
Small Whorled Pogonia *Isotria medeoloides* (*)
Appalachian oak fern *Gymnocarpium appalachianum* (****)
Bartley's reed bent grass *Calamagrostis porter ssp. insperata* (****)
Bog bluegrass *Poa paludigena* (****)
Butternut *Juglans cinerea* (****)
Cliff-green *Paxistima canbyi* (****)
Cooper's milk-vetch *Astragalus neglectus* (****)
Ear-leaf foxglove *Tomanthera auriculata* (****)
Glade spurge *Euphorbia purpurea* (****)
Handsome sedge *Carex formosa* (****)
Juniper sedge *Carex juniperorum* (****)
Lake-cress *Armoracia lacustris* (****)
Purple wood sedge *Carex purpurifera* (****)
Sand sumac *Rhus aromatic var. arenaria* (****)
Skinner's fox glove *Tomanthera skinneriana* (****)
Tall larkspur *Delphinium exaltatum* (****)
Wolf's spikerush *Eleocharis wolfii* (****)

FISH

Ohio lamprey *Ichthyomyzon bdellium* (E)
Northern brook lamprey *Ichthyomyzon fossor* (E)
Mountain brook lamprey *Ichthyomyzon greeleyi* (E)
Lake sturgeon *Acipenser fulvescens* (E)****
Shovelnose sturgeon *Scaphirhynchus platorynchus* (E)
Spotted gar *Lepisosteus oculatus (E)*
Shortnose gar *Lepisosteus platostomus (E)*
Cisco (or Lake herring) *Coregonus artedi* (E)
Goldeye *Hiodon alosoides* (E)
Speckled chub *Macrhybopsis aestivalis* (E)
Pugnose minnow *Opsopoeodus emiliae* (E)
Popeye shiner *Notropis ariomus* (E)
Blackchin shiner *Notropis heterodon* (E)
Blacknose shiner *Notropis heterolepis* (E)
Mississippi silvery minnow *Hybognathus nuchalis (E)*
Blue sucker *Cycleptus elongates* (E)****
Longnose sucker *Catostomus catostomus* (E)
Mountain madtom *Noturus eleutherus* (E)
Northern madtom *Noturus stigmosus (E)*
Scioto madtom *Noturus trautmani* **
Pirate perch *Aphredoderus sayanus* (E)
Western banded killifish *Fundulus diaphanous menona* (E)
Spotted darter *Etheostoma maculatum* (E)

Brook trout *Salvelinus fontinalis* (T)
Bigeye shiner *Notropis boops* (T)
Tonguetied minnow *Exoglossum laurae* (T)
Greater redhorse *Moxostoma valenciennesi* (T)****
Channel darter *Percina copelandi* (T)
American eel *Anguilla rostrata* (T)
Paddlefish *Polyodon spathula* (T)
Rosyside dace *Clinostomus funduloides* (T)
Bigmouth shiner *Notropis dorsalis* (T)
Lake chubsucker *Erimyzon sucetta* (T)
River darter *Percina shumardi* (T)
Bluebreast darter *Etheostoma camurum* (T)
Tippecanoe darter *Etheostoma Tippecanoe* (T)
Lake trout *Salvelinus namaycush* (C)
Lake whitefish *Coregonus clupeaformis* (C)
Burbot *Lota lota* (C)
Muskellunge *Esox masquinongy* (C)
River redhorse *Moxostoma carinatum* (C)
Eastern sand darter *Ammocrypta pellucida* (C)
Least darter *Etheostoma microperca* (C)
Iowa darter *Etheostoma exile* (C)
Spoonhead sculpin *Cottus ricei (C)*
Blue catfish *Ictalurus furcatus (C)*
Paddlefish *Polydon spathula* (****)
Longnose dace *Rhinichthys cataractae (C)*

AMPHIBIANS

Eastern hellbender *Cryptobranchus alleganiensis alleganiensis* (****,E)
Blue-spotted salamander *Ambystoma laterale* (E)
Green salamander *Aneides aeneus* (E)
Cave salamander *Eurycea lucifuga* (E)
Eastern spadefoot *Scaphiopus holbrookii* (E)
Mud salamander *Pseudotriton montanus* (T)
Four-toed salamander *Hemidactylium scutatum* (C)
Eastern cricket frog *Acris crepitans crepitans* (C)
Hellbender *Cryptobranchus alleganiensis* (****)

REPTILES

Copperbelly water snake *Nerodia erythrogaster neglecta* (*E)
Eastern plains garter snake *Thamnophis radix radix* (E)
Timber rattlesnake *Crotalus horridus horridus* (E) ****
Eastern massasauga *Sistrurus catenatus* (E)
Lake Erie water snake *Nerodia sipedon insularum* (*E)
Kirkland's snake *Clonophis kirtlandii* (T) ****
Spotted Turtle *Clemmys guttata* (T)
Eastern box turtle *Terrapene carolina* (C)
Blanding's turtle *Emydoidea blandingii* (C) ****
False map turtle *Graptemys pseudogeographica* (C)
Coal skink *Eumeces anthracinus* (C)
Black king snake *Lampropeltis getula nigra* (C)
Eastern garter snake (melanistic) *Thamnophis sirtalis sirtalis* (C)
Rough green snake *Opheodrys aestivus* (C)
Eastern fox snake *Elaphe gloydi* (C)
Queen snake *Regina septemvittata* (C)
Ground skink *Scincella lateralis* (C)
Smooth ear snake *Virginia valeriae* (C)
Smooth green snake *Liochlorophis vernalis* (C)
Shorthead garter snake *Thamnophis brachystoma* (C)
False map turtle *Graptemys pseudogeographica* (****)
Shorthead garter snake *Crotalus horridus horridus* (****)

BIRDS

American bittern *Botaurus lentiginosus* (E)

Northern harrier *Circus cyaneus* (E)
King rail *Rallus elegans* (E)
Sandhill crane *Grus canadensis* (E)
Piping plover *Charadrius melodus* (E) **
Common tern *Sterna hirundo* (E)
Black tern *Chlidonias niger* (E)
Yellow-bellied sapsucker *Sphyrapicus varius* (E)
Bewick's wren *Thryomanes bewickii* (E)
Loggerhead shrike *Lanius ludovicianus* (E)
Golden-winged warbler *Vermivora chrysoptera* (E)
Kirtland's warbler *Dendroica kirtlandii* (E) **
Lark sparrow *Chondestes grammacus* (E)
Trumpeter swan *Cygnus buccinators* (E)
Snowy egret *Egretta thula* (E)
Cattle egret *Bubulcus ibis* (E)
Appalachian bewick's wren *Thryomanes bewickii altus* (****)
Bachman's sparrow *Aimophila aestivalis* (****)
Bald eagle *Haliaeetus leucocephalus* (C,T) ****
Black rail *Laterallus jamaicensis* (****)
Black tern *Chlidonias niger* (****)
Cerulean warbler *Dendroica cerulean* (C) ****
Common tern *Sterna hirundo* (****)
Henslow's sparrow *Ammodramus henslowii* (C) ****
Loggerhead shrike *Lanitus ludovicianus* (****)
Northern goshawk *Accipiter gentiles* (****)
Peregrine falcon *Falco peregrines* (****)
Upland sandpiper *Bartramia longicauda* (T)
Black-crowned night-heron *Nycticorax nycticorax* (T)
Yellow-crowned night-heron *Nyctanassa violacea* (T)
Barn Owl *Tyto alba* (T)
Dark-eyed junco *Junco hyemalis*
Hermit thrush *Catharus guttatus* (T)
Least bittern *Ixobrychus exilis* (T)
Least flycatcher *Empidonax minimus* (T)
Peregrine falcon *Falco peregrines* (T)
Osprey *Pandion haliaetus* (T)
Sharp-shinned hawk *Accipiter striatus* (C)
Sedge wren *Cistothorus platensis* (C)
Marsh wren *Cistothorus palustris* (C)
Prothonotary warbler *Protonotaria citrea* (C)
Black vulture *Coragyps atratus* (C)
Bobolink *Dolichonyx oryzivorus* (C)
Northern bobwhite *Colinus virginianus* (C)
Common moorhen *Gallinula chloropus* (C)
Great egret *Ardea alba* (C)
Sora rail *Porzana carolina* (C)
Virginia rail *Rallus limicola* (C)

MAMMALS
Indiana myotis *Myotis sodalist* (E)**
Allegheny woodrat *Neotoma magister* (E)****
Bobcat *Lynx rufus* (T)
Black bear *ursus americanus* (E)
Snowshoe hare *Lepus americanus* (E)
Pygmy shrew *Sorex hoyi* (C)
Star-nosed mole *Condylura cristata* (C)
Eastern harvest mouse *Reithrodontomys humulis* (E)
Eastern small-footed bat *Myotis subulatus* (C)****
Rafinesque's big-eared bat *Corynorhinus rafinesquii* (C)****
Southern red-backed vole *Clethrionomys gapperi* (C)
Woodland jumping mouse *Napaeozapus insignis* (C)
Badger *Taxidea taxus* (C)
Ermine *Mustela erminea* (C)

INVERTEBRATES
MOLLUSKS
Snuffbox mollusk *Epioblasma triquetra* (E)
Ebonyshell mollusk *Fusconaia ebena* (E)

Fanshell mollusk *Cyprogenia stegaria* (E)*
Butterfly mollusk *Ellipsaria lineolata* (E)
Elephant-ear mollusk *Elliptio crassidens crassidens* (E)
Purple catspaw mollusk *Epioblasma o. obliquata* (E)*
White catspaw mollusk *Epioblasma obliquata perobliqua* (E)*
Northern riffleshell mollusk *Epioblasma torulosa rangiana* (E)*
Long-solid mullosk *Fusconaia maculate maculate* (E)
Pink mucket mollusk *Lampsilis orbiculata* (E)*
Sharp-ridged pocketbook mollusk *Lampsilis ovate* (E)
Yellow sandshell mollusk *Lampsilis teres* (E)
Eastern pondmussel mollusk *Ligumia nasuta* (E)
Washboard mollusk *Megalonaias nervosa* (E)
Sheepnose mollusk *Plethobasus cyphyus* (E)
Clubshell mollusk *Pleurobema clava* (E)*
Ohio pigtoe mollsuk *Pleurobema cordatum* (E)
Pyramid pigtoe mollusk *Pleurobema rubrum* (E)
Rabbitsfoot mollusk *Quadrula cylindrical cylindrica* (E)
Monkeyface mollusk *Quadrula metanevra* (E)
Wartyback mollusk *Quadrula nodulata* (E)
Purple lilliput mollusk *Toxolasma lividus* (E)****
Rayed bean mollusk *Villosa fabalis* (E)
Little spectaclecase mollusk *Villosa lienosa* (E)
Black sandshell mollusk *Ligumia recta* (T)
Threehorn wartyback mollusk *Obliquaria reflexa* (T)
Fawnsfoot mollusk *Truncilla donaciformis* (T)
Pondhorn mollusk *Unimerus tetralasmus* (T)
Flat floater mollusk *Anodonta suborbiculata* (C)
Purple wartyback mollusk *Cyclonaias tuberculata* (C)
Wavy-rayed lampmussel mollusk *Lampsilis fasciola* (C)
Roung pig-toe mollusk *Pleurobema sintoxia* (C)
Salamander mussel *Simpsonaias ambigua* (C)****
Deertoe mussel *Truncilla truncate* (C)
Elktoe mussel *Alasmidonta marginata* (C)****
Kidneyshell mollusk *Ptychobranchus fasciolaris* (C)
Creek heelsplitter mollusk *Lasmigona compressa* (C)
Pink pig-toe *Pleurobema pyramidatum* (****)

SNAILS
Varicose rocksnail *Lithasia verrucosa* (C)

CRAYFISH
Sloan's crayfish *Orconectes sloanii* (T)
Cavespring crayfish *Cambarus tenebrosus* (T)
Great lakes crayfish *Oroncectes propinquus* (C)
Northern crayfish *Orconectes virilis* (C)
Allegheny crayfish *Orconectes obscures* (C)

BEETLES
Six-banded longhorn beetle *Dryobius sexnotatus, Cicindela splendida, Cicindela ancocisconensis, Cicindela cursitans, Cicindela cuprascens, Cicindela macra* (C)
Cobblestone tiger beetle *Cicindela hirticollis, Cicindela marginipennis* (T)
Six-banded longhorn beetle *Dryobius sexnotatus* (****)

Kramer's cave beetle *Pseudanophthalmus krameri* (E)****
Ohio cave beetle *Pseudoanophthalmus ohioensis* (E)****
American burying beetle *Nicrophorus americanus* (E)*
Black lordithon rove beetle *Lordithon niger* (****)
Cobblestone tiger beetle *Cicindela marginipennis* (****)
Buckskin cave pseudoscorpion *Apochthonius hobbsi* (C)
Laricis tree cricket *Oecanthus laricis* (C)****

ISOPODS
Fern cave isopod *Caecidotea filicispeluncae* (C)****
Frost cave isopod *Caecidotea rotunda* (C)****

DRAGONFLIES
Hines emerald dragonfly *Somatochlora hineana* (E)*
Mottled darner dragonfly *Aeshna clepsydra* (E)
Plains clubtail *Gomphus externus* (E)
American emerald dragonfly *Cordulia shurtleffi* (E)
Uhler's sundragon dragonfly *Helocordulia uhleri* (E)
Frosted whiteface dragonfly *Leucorrhinia frigida* (E)
Elfin skimmer dragonfly *Nannothemis bell* (E)
Canada darner dragonfly *Aeshna canadensis* (E)
Racket-tailed emerald dragonfly *Dorocordulia libera* (E)
Brush-tipped dragonfly *Somatochlora walshii* (E)
Blue corporal dragonfly *Ladona deplanata* (E)
Chalk-fronted corporal dragonfly *Ladona julia* (E)
Yellow-sided skimmer dragonfly *Libellula flavida* (E)
Riffle snaketail dragonfly *Ophiogomphus carolus* (T)
Tiger spiketail dragonfly *Cordulegaster erronea* (C)
Elusive clubtail *Gomphus notatus* (****)
Wabash belted skimmer *Macromia wabashensis* (****)

DAMSELFLIES
Lilypad forktail damselfly *Ischnura kellicotti* (E)
Seepage dancer damselfly *Argia bipunctulata* (E)
River jewelwing damselfly *Calopteryx aequabilis* (E)

CADDISFLIES
Caddisflies *Chimarra socia, Oecetis eddlestoni, Brachycentrus numerosus* (E)
Caddisflies *Psilotreta indecisa, Hydroptila albicornis, Hydroptila artesa, Hydroptila koryaki, Hydroptila talledaga, Hydroptila valhalla* (T)
Caddisflies *Hydroptila chattanooga, Asynarchus montanus, Nemotaulius hostilis* (C)

MAYFLIES
Mayflies *Rhithrogena pellucida, Litobrancha recurvata* (E)
Mayflies *Stenonema ithica* (C)

MIDGES
Midges *Rheopelopia acra* (E)
Midges *Bethbilbeckia floridensis, Apsectrotanypus johnsoni, Radotanypus florens* (T)

Midges *Cantopelopia gesta* (C)

BUTTERFLIES

Persius dusky wing butterfly *Erynnis persius* (E)
Frosted elfin butterfly *Incisalia irus* (E)
Karner blue butterfly *Lycaeides melissa samuelis* (E)*
Purplish copper butterfly *Lycaena helloides* (E)
Swamp metalmark butterfly *Calephelis muticum* (E)
Silver-bordered fritillary butterfly *Boloria selene* (T)
Regal fritillary butterfly *Speyeria idalia* (E)****
Mitchell's satyr butterfly *Neonympha mitcdhellii* (E)*
Grizzled skipper butterfly *Pygus centaureae wyandot* (E)
Two-spotted skipper butterfly *Euphyes bimacula* (C)
Dusted skipper butterfly *Atrytonopsis hianna* (C)
Grizzled skipper *Pyrgus wyandot* (****)
Diana fritillary *Speyeria diana* (****)

MOTHS

Unexpected cycnia moth *Cycnia inopinatus* (E)
Graceful underwing moth *Catocala gracilis, Spartiniphaga inops, Hypocoena enervata, Papaipema silphii, Papaipema beeriana, Lithophane semiusta, Trichoclea artesta, Tricholita notata, Melanchra assimilis* (E)
Pointed sallow moth *Epiglaea apiata, Ufeus plicatus, Ufeus satyricus* (E)
Hebard's noctuid moth *Erythroecia hebardi* (E)****
Wayward nymph moth *Catocala antinympha, Spartiniphaga panatela, Fagitana littera* (T)
The pink-streak moth *Faronta rubripennis* (T)
Milnei's looper moth *Euchlaena milnei* (C)
Buck moth *Hemileuca maia* (C)
One-eyed sphinx moth *Smerinthus cerisyi* (C)
Precious underwing moth *Catocala pretiosa* (****), *Macrochilo bivittata, Phalaenostola hanhami, Paectes abrostolella, Capis curvata, Tarachidia binocula, Apamea mixta, Agroperina lutosa* (C)
Columbine borer moth *Papaipema leucostigma* (C)
Bracken borer moth *Papaipema pterisii* (C)
Osmunda borer moth *Papaipema speciosissima, Chytonix sensilis, Amolita roseola (C)*
Goat sallow moth *Homoglaea hircina, Brachylomia algens* (C)
Purple arches moth *Polia purpurissata* (C)
Scurfy quaker moth *Homorthodes f. furfurata, Trichosilia manifesta, Agonopterix pteleae* (C)
Albarufan dagger moth *Acronicta albaruta* (****)
Looper moth *Euchlaena milnei* (****)

Source: Ohio Department of Natural Resources. 2045 Morse Road, Bldg. G Columbus, OH 43229
US Fish and Wildlife Ecological Services. 2045 Morse Road, Suite 104 Columbus, OH 43230

APPENDIX D

OHIO ADMINISTRATIVE CODE CHAPTER 1501:31-15-03
NUISANCE WILD ANIMAL REGULATIONS

Section 525.10 Purpose

This Part has been established to govern the taking, possession, transport, and disposition of Protected Species as defined by Section 1501 of the Wildlife Code [OH 31-15-03] which are causing damage to property or a risk to human health or safety and the issuance of Nuisance Wildlife Control Permits.

Section 525.20 General Provisions

1501:31-15-03 Nuisance wild animal regulations.

(A) Landowners and tenants:

It shall be lawful for any person to trap live, non-migratory animals, except white-tailed deer, black bear, or wild turkey when such animals have become a nuisance. Such trapping shall be in accordance with the following provisions:

(1) It shall be unlawful for any person to set or use a trap to capture wild animals, unless such trap has attached thereto a durable waterproof tag bearing the name and mailing address of the user in English letters legible at all times, or which has the name and mailing address of the user stamped into such trap in English letters legible at all times.

(2) It shall be unlawful for any person to possess such live-trapped animals longer than twenty-four hours from the time of capture.

(3) It shall be unlawful for any person to live-trap animals on the lands of another without first obtaining written permission from the owner or his authorized agent.

(4) Every person who live-traps a wild animal shall release such animal outside the limits of any incorporated village or city. Animals shall not be released on public or private property without the permission of the landowner. Provided further, raccoon, skunk, opossum, beaver, coyote or fox shall be euthanized or released on site.

(5) It shall be unlawful for any person to sell, use, or give to another person, any animal trapped for removal in accordance with this rule.

(6) Any person who traps a wild animal in accordance with paragraph (A) of this rule, shall

not charge a fee or receive compensation.

(B) Nuisance trapping permit holders:

Notwithstanding any other provision in this rule, it shall be lawful for any person applying for and receiving a nuisance wild animal trapping permit, and any person acting under the authority of a nuisance wild animal trapping permit, and possessing an Ohio hunting license and valid Ohio furtakers permit to trap wild animals except, white-tailed deer, wild turkey, black bear, and waterfowl. Such trapping shall be in accordance with the following provisions:

(1) Wild animals trapped or captured under authority of a nuisance wild animal trapping permit may be accumulated for not more than ten days.

(2) Injured wild animals trapped or captured under the authority of a nuisance wild animal trapping permit may be killed subject to approval of the representative of the division of wildlife.

(3) A division of wildlife representative approving a nuisance wild animal trapping permit may include specific stipulations on the permit under which wild animals may be trapped or captured. It shall be unlawful for any person to violate any stipulation set forth on their permit. A violation of any permit stipulation is a violation of this rule and such permit is then subject to revocation by the chief of the division of wildlife.

(4) Wild animals which are causing damage and which cannot be live-trapped because of certain conditions may be killed by licensed nuisance wild animal trappers or other persons only after such trappers or other persons apply for and receive written permission from the chief of the division of wildlife or his designee. No such written permission is required to kill or use lethal means of capture for raccoons, squirrels, groundhogs, chipmunks, moles, muskrats or beaver.

(5) It shall be unlawful to use a body gripping trap with a jaw spread greater than seven inches by seven inches in a building. Provided further, it shall be unlawful to set or maintain any trap outside of a building which does not comply with rule 1501:31-15-09 of the Administrative Code.

(6) It shall be unlawful for a non-resident to trap nuisance wild animals if residents of Ohio may not trap nuisance wild animals in their state.

(7) It shall be lawful to set, use, and maintain snares to trap nuisance wild animals.

(8) Unless otherwise stated in this chapter, all wild animals trapped under the authority of the nuisance wild animal trapping permit shall be released outside the limits of any incorporated city or village. Animals shall not be released on public or private property without the permission of the landowner. Except any raccoon, skunk, beaver, coyote, fox, or opossum that is trapped or taken shall be euthanized, or released on site. Squirrels, chipmunks and

moles may be released on site or euthanized within twenty-four hours instead of released.

(C) Nuisance white-tailed deer, black bear, and wild turkey:

(1) White-tailed deer, black bear, and wild turkey, which are causing damage or have become a nuisance may be captured or killed by licensed nuisance wild animal trappers or other persons, only after such trappers or other persons have received written permission from the chief of the division of wildlife or his designee.

(2) The division of wildlife representative approving a permit for a nuisance wild animal trapper or other person to take, trap or capture white-tailed deer, black bear, or wild turkey may include specific stipulations on that permit under which white-tailed deer, black bear, or wild turkey may be captured or killed. It shall be unlawful for any person to violate any stipulation set forth on their permit. A violation of any permit stipulation is a violation of this rule and such permit is then subject to revocation by the chief of the division of wildlife or his designee.

(3) All white-tailed deer immobilized with chemicals or drugs shall be euthanized, or released upon approval of the chief, or his designee.

(D) Nuisance Canada geese:

(1) Canada geese which are causing damage or have become a nuisance may be captured or taken by licensed nuisance wild animal trappers, landowners, or agents of the landowner, only after such landowner where the damage or nuisance is occurring has received a goose damage permit from the chief of the division of wildlife or his designee.

(2) The division of wildlife representative approving a goose damage permit for a landowner may include specific stipulations on the permit under which waterfowl may be trapped, captured, or taken. It shall be unlawful for any person to violate any stipulation set forth on their permit. A violation of any permit stipulation is a violation of this rule, and such permit is the subject to revocation by the chief or his designee.

(E) Persons possessing a nuisance wild animal trapping permit may charge a fee for removal of nuisance wild animals. It shall be unlawful for any nuisance wild animal trapper to sell any wild animals that he/she traps. Except, the nuisance wild animal trapper may sell the carcass of raccoon, opossum, beaver, and muskrat at any time. Hides of furbearers acquired during the open season under the nuisance wild animal trapping permit may be sold only during open season for furbearing animals.

(F) Notwithstanding any other provision in this rule, it shall be lawful for persons to destroy nests, and render eggs of nuisance waterfowl unviable, after authorization is given by the chief of the division of wildlife, or his designee in a manner approved by the chief.

(G) It shall be lawful for a landowner, his agent or tenant to trap or take raccoons, opossums,

coyote, fox and skunk which are causing damage, are a nuisance, or are sick in accordance with paragraphs (A) and (B) of this rule. Any raccoon, opossums, coyote, fox or skunk which is trapped or taken shall be euthanized within twenty-four hours. Provided further, it shall be unlawful to take raccoon, opossums, coyote, fox or skunk with the use of dogs during closed season.

(H) Notwithstanding any other provision in this rule, it shall be lawful for any person to take crows which are found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance, provided:

> It shall be unlawful to take or attempt to take crows under paragraph (H) of this rule with the aid or assistance of any calls, artificially placed bait or decoys.

(I) All definitions set forth in rule 1501:31-1-02 of the Administrative Code shall apply to this rule.

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