ENVIRONMENTAL ASSESSMENT:
White-tailed Deer Damage Management in Ohio

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Animal and Plant Health Inspection Service
Wildlife Services

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ACRONYMS

AMDUCA	Animal Medical Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSA	Cooperative Service Agreement
CVNP	Cuyahoga Valley National Park
CWD	Chronic Wasting Disease
DEA	Drug Enforcement Agency
DDMP	Deer Damage Management Permit
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLIR	Forward Looking Infrared
FY	Fiscal Year
HD	Hemorrhagic Disease
IWDM	Integrated Wildlife Damage Management
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NWRC	National Wildlife Research Center
ODA	Ohio Department of Agriculture
ODH	Ohio Department of Health
ODW	Ohio Division of Wildlife
ORC	Ohio Revised Code
SOP	Standard Operating Procedures
T&E	Threatened and Endangered
TA	Technical Assistance
TB	Tuberculosis
TSE	Transmissible Spongiform Encephalopathies
US	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
WAC	Wildlife Acceptance Capacity
WDDM	White-tailed Deer Damage Management
WS	Wildlife Services

CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

1.1 PURPOSE

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program continues to receive requests for assistance to resolve human conflicts with white-tailed deer (*Odocoileus virginianus*) in Ohio. This Environmental Assessment (EA) documents the analysis of the potential environmental effects of a proposed Ohio WS integrated white-tailed deer damage management (WDDM) program to alleviate damage to agriculture, property, natural resources, and human health, and human safety.

WS is the federal agency directed by law and authorized to protect American resources from damage associated with wildlife. WS activities are conducted to prevent or reduce wildlife damage caused to agricultural, industrial and natural resources, property, and threats to public health and safety on private and public lands in cooperation with federal, state, and local agencies, private organizations, and individuals. Therefore, wildlife damage management is not based on punishing offending animals but on reducing damage and is used as part of the WS Decision Model (Slate et al. 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to resources or the public. WS's vision is to improve the coexistence of people and wildlife, and its mission is to provide federal leadership in managing problems caused by wildlife.

The purpose of this EA is to evaluate cumulatively the individual projects conducted by WS to manage damage and threats to agricultural resources, property, industrial natural resources, and threats to humans caused by white-tailed deer. This EA will assist in determining if the proposed cumulative management of deer damage could have a significant impact on the environment for both humans and other organisms, based on previous activities conducted and based on the anticipation of receiving additional requests for assistance. Because the goal of WS is to conduct a coordinated WDDM program in accordance with plans, goals, and objectives developed 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 damage management efforts could occur. Thus, this EA anticipates those additional efforts and the analyses would be intended to apply to actions that may occur in any locale and at any time within Ohio as part of a coordinated program.

More specifically, WS is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of proposed activities; and 5) evaluate and determine if there would be any potentially significant individual or cumulative adverse effects from the implementation of a damage management program.

WS is a cooperatively funded, service-oriented program from which other governmental agencies or private entities may request assistance. Before any wildlife damage management is conducted on public or private land, Cooperative Service Agreements (CSA) or other comparable documents are in place. WS cooperates with state, federal, and local land and wildlife management agencies to reduce wildlife damage effectively and efficiently according to applicable federal, state, and local laws and Memorandums of Understanding (MOUs) between WS and other agencies/entities.

Wildlife damage management is the science of reducing damage or other problems caused by wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 2010). WS uses an Integrated Wildlife Damage Management (IWDM) approach, also known as Integrated Pest Management (WS Directive 2.105[1]), in which a combination of methods may be used or recommended to reduce wildlife damage. These methods may include alteration of cultural practices and habitat and behavioral modification to prevent or reduce damage. The reduction of wildlife damage may require that the local populations of offending animal(s) be reduced through lethal means.

Both sociological and biological carrying capacities must be considered when resolving wildlife damage problems. The wildlife acceptance capacity (WAC), or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). When this number is exceeded, the health of the population begins to suffer, reproduction declines, parasitism and disease increase, and habitat quality and diversity decrease due to over browsing of plant species preferred as food by deer (Kroll et al. 1986). Those phenomena are especially important because they define the sensitivity of a person or community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. This damage threshold determines the WAC. While the biological carrying capacity of habitat may support higher populations of wildlife, in many cases, the wildlife acceptance capacity is lower or has been met. Once the WAC is met or exceeded, people begin to implement population or damage management to alleviate damage or address threats to human health and human safety.

1.2 NEED FOR ACTION

Within Ohio and across the United States (U.S.), 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 wildlife thereby increasing the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for some or all wildlife which may increase populations and create localized conflicts between human and wildlife activities. Wildlife has either positive or negative values, depending on varying human perspectives and circumstances. Wildlife is generally regarded as providing economic, recreational and aesthetic benefits and the mere knowledge that wildlife exists is a positive benefit to many people. However, the activities of some wildlife may result in economic losses to agriculture and damage to property. Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.

Deer occupy a broad range of habitats and reproduce rapidly under the right conditions, resulting in a sharp population increase throughout their range (Rooney and Waller 2002). With the expansion of human populations into rural environments, and the historic decline of natural deer predators (e.g., gray

[1] WS Policy Manual - 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.

wolf and cougar), the potential for human-deer encounters will inevitably increase. Unfortunately, these encounters are often in the form of deer-vehicle collisions, deer-aircraft encounters, and damage to landscaping, natural resources, horticulture, and agricultural commodities. While hunting is still an effective tool to manage deer populations in rural environments, other options must be considered to manage overabundant deer herds in non-traditional settings (i.e., airports, city parks, suburban areas, etc.). Both lethal and non-lethal options need to be assessed to minimize the potential negative impact that over abundant deer may have on the human environment.

1.2.1 Deer-Vehicle Collisions

Deer-vehicle collisions are a serious concern nationwide because of losses to property and the potential for human injury and death (Conover et al. 1995, Romin and Bissonette 1996, Conover 1997). The economic costs associated with deer-vehicle collisions include vehicle repairs, human injuries and fatalities, and picking up and disposing of deer. Annually, there are estimated to be more than 1,000,000 deer-vehicle collisions nationwide (Williams et al. 2012). Williams et al. (2012) also estimated that there were more than 200 human deaths attributable to deer-vehicle collisions annually. During 2015, the number of deer-related claims paid out by State Farm increased 6% ($4,135) from the 2014 average ($3,888) (State Farm Mutual Automobile Insurance Company 2015). Often, deer-vehicle collisions, in which a deer carcass was not recovered or little vehicle damage occurred, go unreported. A Cornell University study estimated that the actual number of deer-vehicle collisions could be as high as six times the reported number (Decker et al. 1990). In Ohio, there were 19,705 reported deer-vehicle collisions in 2014; a 2.5% decrease from the 20,201 deer-vehicle collisions reported in 2013. There were four related fatalities and 798 injuries in Ohio 2014. This compares to eight fatalities and 968 injuries reported in 2013 (Ohio Insurance Institute 2015).

1.2.2 Hazards at Airports

Airports provide ideal conditions for feeding and bedding sites for deer due to the large grassy areas adjacent to brushy, forested habitat used as noise barriers. Deer living within airport boundaries are usually protected from hunting and many other human disturbances.

Deer-aircraft strikes can result in loss of human life, injury to passengers or people on the ground, damage or malfunction of aircraft, aircraft navigational aids, or airport facilities. Mammals colliding with aircraft during the most vulnerable phases of flight, takeoff or landing, can cause the aircraft to crash or sustain physical damage. Serious consequences are also possible if pilots lose control of the aircraft while attempting to avert a collision with deer. Mammals are characteristically unpredictable in their initial response to approaching aircraft. Deer may wander onto runway surfaces and be startled into the path of oncoming aircraft, and at night, they may freeze when caught in the beams of landing lights, resulting in a strike. The majority of deer strikes occur at night and in the fall during the mating season (Dolbeer et al. 2014).

Of all wildlife species, deer are ranked as the most hazardous to aircraft, especially to smaller general aviation aircraft (Dolbeer et al. 2000), and they represent a serious threat to human health and safety. Airports are often secured areas with chain-link security fencing. Sometimes deer gain entrance into these airports where there is adequate cover and food, and they live there for all or part of the year.

Because deer are abundant throughout Ohio, it is possible for deer to be present at nearly any airport in the state.

From January 1990 through 2013, there were 1070 reported deer aircraft strikes in the U.S. (Dolbeer et al. 2014). Thirty-eight (3.6%) of those strikes were reported to have occurred in Ohio. Deer accounted for 34% of the reported strikes involving terrestrial mammals in the U.S. (Dolbeer et al. 2014). The number of deer strikes actually occurring is likely to be much greater, since Dolbeer (2009) estimated that only 39% of civil wildlife strikes are actually reported. Data also indicates that a much higher percentage of mammal strikes resulted in aircraft damage compared to bird strikes. Costs of those collisions vary, but the Federal Aviation Administration (FAA) data reveals that deer strikes in the U.S. cost the civil aviation industry approximately 238,058 hours of down time and nearly $44 million in direct monetary losses between 1990 and 2013 (Dolbeer et al. 2014).

1.2.3 Damage to Natural Resources, Urban Areas, and Landscaping

Urban Areas and Landscaping

Deer are prolific and adaptable, allowing them to prosper and exploit most suitable habitat near urban areas, including residential areas (Jones and Witham 1995). High deer population densities can result in over-browsing, which may damage or destroy landscaping and ornamental trees, shrubs, and flowers. As rural areas are developed, deer habitat may actually be enhanced because fertilized lawns, gardens, and landscape plants serve as high quality sources of food (Swihart et al. 1995). A 2001 study of the attitudes of residents living in proximity to the Cuyahoga Valley National Park (CVNP) towards deer management indicated that approximately 83.2 percent of respondents felt that too much damage to shrubs, crops, and gardens would result if no deer management plan were in place. Additionally, 91.2 percent of respondents indicated that reducing deer damage to shrubs, crops, and gardens would be beneficial (CVNP 2013). Although damage to landscaping and ornamental plants has not been quantified in and around urban parks, deer have caused significant and costly property damage to individual homeowners. For fiscal year (FY) 09 through FY14, $18,000 in damage to landscaping and property from deer browsing/grazing in Ohio was reported to WS. While this number may appear low, it's likely only a fraction of damage that occurs in the state, as not all damage is reported to WS. In addition to browsing pressure, male white-tailed deer damage ornamental trees and shrubs by antler rubbing which results in broken limbs and bark removal. While large trees may survive antler rubbing damage, smaller saplings often die or become scarred to the point that they are not aesthetically acceptable for landscaping.

Natural Resources

Deer have been identified as a keystone species in forest ecosystems; meaning their feeding activities directly or indirectly affect many other species (Rawinski 2008). Deer overabundance can affect native vegetation and natural ecosystems in addition to ornamental landscape plantings. Deer often select the most preferred species, reducing plant diversity, and creating a monoculture (Rawinski 2008). Ecosystem alterations caused by deer can lead to adverse impacts on other wildlife species, which depend on these plants for food and/or shelter. Deer consume seeds that may remain viable in the feces, resulting in the spread/germination of plants. A study in Connecticut showed that seeds from 57 different plant species found in deer feces remained viable. Of those, 32 were exotic species with some being highly invasive

species such as autumn olive and wine raspberry (Rawinski 2008). Over-browsing by deer can have a dramatic impact upon other wildlife communities (e.g., Neotropical migrant songbirds, insects, and small mammals). Numerous studies have shown that over-browsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and plant diversity (Warren 1991, Horsley et al. 2003, DiTommaso et al. 2014, Nuttle et al. 2011, CVNP 2013). Deer often select for woody species, as well as native and non-native herbs, resulting in a depressed seed bank in secondary successional systems, such as recovering old-field communities (DiTommaso et al. 2014). In Pennsylvania, DeCalesta (1997) reported that deer browsing affected vegetation that songbirds need for foraging surfaces, escape cover, and nesting. Also, species richness and abundance of intermediate canopy nesting songbirds was reduced in areas with higher deer densities (DeCalesta 1997). Intermediate canopy-nesting birds declined 37% in abundance and 27% in species diversity at higher deer densities. Five species of birds were found to disappear at densities of 38.1 deer/mi2 and another two disappeared at 63.7 deer/mi2. Similarly, the Cuyahoga Valley National Park (CVNP) reports that although sites with high and low deer densities support similar total numbers of bird species, it does appear that the overall abundance of individuals was significantly lower in high deer density areas, particularly for those species that nest and forage in the forest understory (CVNP 2013). Waller and Alverson (1997) hypothesize that by competing with squirrels and other fruit eating animals for oak mast, deer may further affect many other species of animals and insects. High deer densities result in over-browsing, which can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). A study published in 2011 on herbivore pressure on ecosystems documented long term changes in the trophic levels in forest canopies over a 30 year period (Nuttle et al. 2011). Over-browsing by ungulates resulted in the reduction of foliage and canopy herbivore (caterpillar) densities, which resulted in the decline of insectivorous birds. The authors concluded that changes documented lasted well beyond the time when over-browsing occurred, affecting the environments for at least 20 years, if not until full stand replacement occurs (>100 years) (Nuttle et al. 2011). One study of an unchecked deer population in Ohio showed that 150 vascular plants were extirpated when deer densities reached greater than 110 deer/mi^2 (Rooney and Waller 2002).

1.2.4 Threats to Wildlife and Livestock Health and Safety from Disease Transmission

Chronic Wasting Disease. Chronic Wasting Disease (CWD) is a nervous system disease affecting members of the Family Cervidae, including Rocky Mountain elk (*Cervus canadensis*), red deer (*Cervus elaphus*), mule deer (*Odocoileus hemionus)*, black-tailed deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), sika deer (*Cervus nippon*), and Moose (*Alces alces*) (USDA 2014) . It belongs to the family of diseases known as transmissible spongiform encephalopathies (TSE's) or prion diseases. Though it shares certain features with other TSE's like bovine spongiform encephalopathy ("Mad Cow Disease") or scrapie in sheep, it is a distinct disease apparently affecting only species of the family cervidae. CWD originally occurred in wild deer and elk primarily in northeastern Colorado, and adjacent parts of Wyoming, Nebraska, and South Dakota.

CWD attacks the brains of infected deer, causing the animal to become emaciated, display abnormal behavior, lose bodily functions, and die. Signs identified in captive deer include excessive salivation, loss of appetite, progressive weight loss, excessive thirst and urination, listlessness, teeth grinding, holding the head in a lowered position, and drooping ears. CWD is a slowly progressive disease and clinical signs may manifest anywhere from months to years after infection. Clinical signs are usually not seen until the

animal is 18 months of age or older. Once clinical signs are observed, death normally occurs within weeks or months, and CWD is always fatal.

There is no evidence that CWD can be transmitted under natural conditions to humans or cattle (USDA 2001). The mode of transmission between deer is not completely understood. It is thought that the disease can be passed between animals in a herd and also from close contact between mother and offspring (USDA 2001). Infectious prions are not easily killed by environmental factors, heat, or disinfection, so transmission from a contaminated environment may also be possible (WDNR 2002, Miller et al. 2004).

The Ohio Division of Wildlife (ODW) is responsible for managing wild, free-ranging deer and the Ohio Department of Agriculture (ODA) is responsible for captive deer herds. Since 2002, the Ohio ODW has conducted CWD disease surveillance throughout the state, testing more than 11,000 free ranging deer. The ODA requires testing on captive cervids over 12 months of age that die at regulated facilities. To date, there has yet to be a wild, free-ranging deer test positive for the disease in the state. However, on October 24, 2014, it was announced that CWD was confirmed at a captive cervid facility in Holmes County Ohio. The shooting preserve in Holmes County was depopulated in April of 2015, and tests revealed no additional CWD-positive animals. In March and April of 2015, two deer from a captive breeding facility in Holmes County tested positive for CWD. This facility was depopulated in mid-June, and of the 242 deer that were destroyed, 16 tested positive for CWD, bringing the total number of CWD-positive deer in Ohio to 19. The disease has still not been detected in Ohio's wild, free-ranging deer herd. The Holmes County facility was one of 43 quarantined facilities that had received deer tracing back to an infected facility in Pennsylvania. Twenty one captive cervid facilities in Ohio remain under quarantine and surveillance efforts near those facilities have increased.

It is possible that WS could be asked to assist regulatory authorities in depopulating infected captive herds. Depopulation efforts are more intense than those used to manage a wild population, in that it requires all individuals in a population be removed. WS may also be asked by ODW to assist with population control to manage CWD prevalence in wild populations of deer in portions of Ohio.

Bovine Tuberculosis. Tuberculosis (TB) is a contagious disease of both animals and humans and can be caused by three specific types of the Mycobacterium bacteria (USDA 1995). Bovine TB, caused by *Mycobacterium bovis*, primarily affects cattle and other bovine-like animals (e.g., bison, deer, and goats) but can be transmitted to humans and other animals (USDA 1995). Transmission between deer and cattle can occur via either direct or indirect means. Direct transmission could occur through nose-to-nose contact. Due to the social nature of deer, transmission between deer could be amplified. Transmission between deer is known to occur when an infected deer coughs near another (e.g., nose to nose) and droplets of saliva, in aerosol form, containing the bacteria are transmitted to a nearby deer (McGinness 1998). Transmission among other age classes of deer occurs primarily through nose-to-nose contact. Older bucks show higher prevalence rates possibly due to breeding activity. Indirect transmission could occur at contaminated hay bales, feed troughs, and bait/feed piles.

Pathogenesis of *M. bovis* infection in deer begins with either inhalation or ingestion of infectious organisms. Transmission is aided by high deer density and prolonged contact, as occurs at supplemental feeding sites. The bacilli commonly invade the tonsil first, later spreading to other cranial lymph nodes. If the infection is contained, it spreads no further. In some animals the infection spreads to the thorax

where it may disseminate throughout the lungs; these animals may then shed the bacteria by aerosol or oral secretions. The most susceptible animals develop disseminated infections throughout their abdominal organs, and can even shed bacilli through their feces or through their milk to their fawns.

The USDA Cooperative State-Federal Tuberculosis Eradication Program, which began in 1917, is responsible for the near-eradication of the disease from the Nation's livestock population. Under the new USDA rules governing state bovine TB status, Ohio maintained its "Accredited Free" status (USDA Veterinary Services 2015). This means the state has no TB prevalence in cattle, bison, and goat herds and no TB in the past three years from the time the last infected herd was depopulated or from the time of surveillance indicating no risk of TB spreading. Since human occupational and recreational activities involving deer have been occurring for so long, it appears that the risk of tuberculosis in humans from this situation is low.

Tick Borne Diseases. The Ohio Department of Health (ODH) documents and tracks several tick-borne diseases in addition to Lyme disease, including babesiosis, ehrlichiosis and Rocky Mountain spotted fever. The same tick that carries the Lyme disease bacterium also carries these pathogens. Ticks are common vectors for diseases that can be associated with vertebrates such as white-tailed deer. Currently, the most common zoonosis involving deer is Lyme disease, caused by the bacterium *Borrelia burgdorferi* and vectored to humans by the deer tick (*Ixodes scapularis*) in the eastern U.S. (Conover 1997). Deer ticks are also called blacklegged ticks. Initial symptoms of Lyme disease include a flu-like illness often accompanied by a characteristic bulls-eye rash, headache, fever, muscle or joint pain, neck stiffness, swollen glands, jaw discomfort, and inflammation of the eye membranes. If left untreated, heart, nervous system, and joint manifestations may develop (McLean 1994).

Limited information is known about the relationship between white-tailed deer and the spread of Lyme disease-carrying deer ticks. Small mammals and birds are reservoirs of the bacterium that causes Lyme disease, and immature deer ticks primarily feed on these animals in the spring. In the fall, adult deer ticks preferentially feed on white-tailed deer (Hayes and Piesman 2003), and this provides a final blood meal that is necessary for adult deer ticks to mate and reproduce (American Lyme Disease Foundation 2010). The transmission of the *B. burgdoferi* bacterium to humans occurs when an infected tick attaches to a person and feeds, usually for a minimum of 36 hours (Hayes and Piesman 2003). Although deer are implicated in the spread of deer ticks which vector Lyme disease, researchers have found varying conclusions on the relationship between deer densities and deer tick densities. Reducing deer densities in isolated environments such as islands and peninsulas has been shown to have a positive effect on reducing the disbursement and abundance of deer tick nymphs (Deblinger et al. 1993, Kilpatrick et al. 2014). Additionally, reduced deer densities in these isolated environments has been shown to correspond with a reduction in tick infection rates, and a reduction in the reported cases of human Lyme disease (Kilpatrick et al. 2014). However, this same relationship is uncertain in more open landscapes, and the level of deer reduction that would be necessary is unknown. There were 94 confirmed cases of Lyme disease in Ohio during 2014. For the period of 2005-2014 there has been a yearly average of 50 cases of Lyme disease diagnosed in Ohio (range 21-94; Centers for Disease Control and Prevention (CDC) (CDC 2015).

1.2.5 Deer Damage to Agriculture

Deer damage to agricultural crops can have a substantial negative economic impact on individual farm operators. Deer damage a broad variety of vegetables, row crops, fruit, nursery stock, stacked hay, and ornamentals. Most instances of deer damage to crops are handled by the ODW which may issue crop depredation permits. From 2009-2013, the ODW received an annual average of 1,460 complaints (range 1177-1953 complaints/year) regarding deer damage to crops (ODW 2010, 2011, 2012, 2013, 2014).

Little current data is available quantifying deer damage to crops in Ohio, however other data is available from adjacent states. An Indiana study by Humberg et al. (2004), indicated that soybeans were the principal crop damaged (36% of complaints), followed by corn (30%). 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 (*Marmota monax*; 38%) were responsible for nearly all damage to soybean plants (Humberg et al. 2004). The estimated economic loss from deer depredation to high-value agricultural crops for 1995 in Pennsylvania was $17,506,294 (Drake et. al 2003). High-value agricultural crops included fresh market and processed vegetables, including but not limited to snap beans, sweet corn, leafy vegetables, tomatoes, and peppers. Apples and peaches were also included as high-value crops. The estimated economic loss from deer depredation to grain crops for 1995-1996 in Pennsylvania was $25,738,984. Grain crops included corn (silage and grain), soybeans, wheat, and oats (Drake et. al 2003).

1.3 DECISION TO BE MADE

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

- Should WS continue the current WDDM program in Ohio to alleviate damage to agriculture, property, natural resources, human health, and human safety or select one of the other proposed alternatives?

- Would the proposed action have significant impacts on the quality of the human environment requiring preparation of an Environmental Impact Statement (EIS)?

1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.4.1 Actions Analyzed

This EA evaluates WS involvement in WDDM to protect property, agricultural resources, natural resources, human health, and human safety in the State of Ohio.

1.4.2 Period for which this EA is Valid

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

1.4.3 Site Specificity

This EA analyzes and addresses the potential impacts of WS WDDM activities on all private and public lands in Ohio under MOU, Cooperative Agreement, and in cooperation with the appropriate public land management agencies. It also addresses the impacts of WS WDDM 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 wildlife damage management efforts could occur anywhere in Ohio. Thus, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program. Planning for the management of deer damage must be viewed as being conceptually similar to other federal or agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply wherever deer 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 (see Description of Alternatives for a description of the Decision Model and its application).

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

1.4.4 Public Involvement/Notification

This EA has been made available to the public for a comment period for 30 days. A notice of availability has been published in *Columbus Dispatch* and has also been emailed to stakeholders via the APHIS Stakeholder Registry. The notice of availability has also been posted on the WS web site at http://www.aphis.usda.gov/wildlifedamage/nepa. Public notification procedures have been conducted in compliance with WS' NEPA implementation procedures published in the Federal Register March 21, 2007 (Vol. 72, No. 54: 13237-13238).

1.5 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

USDA 2009 Environmental Assessment: White-tailed Deer Damage Management in Ohio.

WS has previously developed an EA that analyzed the need for action to manage damage associated with deer (USDA 2009). Changes in the need for action and the affected environment have prompted WS and cooperating agencies to initiate this new analysis to address the need for deer damage management. This EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action. Since activities conducted under the previous EA will be re-evaluated under this EA to address the new need for action and the associated affected environment, the previous EA that addressed deer will be superseded by this analysis and the outcome of

the Decision issued based on the analyses in this EA. However, the need for action associated with the previous EA continues to be appropriate until superseded by this EA.

1.6 AUTHORITY AND COMPLIANCE

1.6.1 Wildlife Services

The primary statutory authorities for the WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 USC 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c). The WS program is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human safety associated with wildlife. WS' directives define program objectives and guide WS' activities to manage wildlife damage management.

Additionally, MOU 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 Ohio Department of Natural Resources, Division of Wildlife (ODW)

As authorized by Ohio Revised Code (ORC) 1531.04, "the ODW, at the direction of the chief of the division, shall do all of the following: (A) Plan, develop, and institute programs and policies based on the best available information, including biological information derived from professionally accepted practices in wildlife and fisheries management, with the approval of the director of natural resources; (B) Have and take the general care, protection, and supervision of the wildlife in the state parks known as Lake St. Marys, The Portage Lakes, Lake Loramie, Indian Lake, Buckeye Lake, Guilford Lake, such part of Pymatuning Reservoir as lies in this state, and all other state parks and lands owned by the state or in which it is interested or may acquire or become interested, except lands and lakes the care and supervision of which are vested in some other officer, body, board, association, or organization; (C) Enforce by proper legal action or proceeding the laws of the state and division rules for the protection, preservation, propagation, and management of wild animals and sanctuaries and refuges for the propagation of those wild animals, and adopt and carry into effect such measures as it considers necessary in the performance of its duties" (ORC §1531.04).

1.6.3 Ohio Department of Agriculture (ODA)

Ohio Department of Agriculture and its Division of Animal Industry is charged with protecting and promoting the health of Ohio's livestock and poultry industries. Responsibilities include livestock and poultry testing and inspection, licensing, controlling animal diseases in Ohio, and providing veterinary diagnostic laboratory services (http://www.ohioagriculture.gov/animal/). The ODA is also responsible for regulation of captive cervids.

1.6.4 United States Department of Interior (USDI), Fish and Wildlife Service (USFWS)

The primary responsibility of the USFWS is conserving fish, wildlife, plants and their habitats. While some of the USFWS's responsibilities are shared with other federal, state, tribal, and local entities, the USFWS has special authorities in managing the National Wildlife Refuge System; conserving migratory

birds, federally-listed endangered species, certain marine mammals, and interjuridictional fisheries; and enforcing Federal wildlife laws. Of particular importance to this EA is the USFWS' responsibility to implement and enforce the ESA of 1973, as amended.

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 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 ODNR 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, to include the Ohio EPA and the USACE, 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.

CHAPTER 2. AFFECTED ENVIRONMENT AND ISSUES

Chapter 2 contains a discussion of the issues, including the issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Those issues were also used to develop standard operating procedures (SOPs) and Alternatives in Chapter 3. Issues that were identified but were not considered in detail are also discussed with rationale in this chapter. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop minimization measures.

2.1 AFFECTED ENVIRONMENT

The affected environment includes not only the local wildlife populations within the area under consideration, but also native flora, native fauna, and human populations and their respective environments. The areas of the proposed action include farms and areas where deer are causing damage to agriculture through feeding and antler rubbing; public and private properties in urban/suburban areas where deer cause damage to landscaping and natural resources; urban/suburban and rural areas where deer cause damage to property during deer-vehicle collisions and are a threat to human safety through deer-vehicle collisions; and areas where deer have the potential to spread diseases to humans and/or livestock. The area of the proposed action would also include airports, military airbases and controlled-access properties surrounded by fencing where deer are a threat to human safety and to property.

2.2 ENVIRONMENTAL STATUS QUO

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

For deer management in Ohio, the ODW has the authority to manage and authorize the taking of deer for damage management purposes. In those situations where a non-federal entity has obtained the appropriate permit or authority, and has already made the decision to remove, depopulate (captive deer), or otherwise manage deer to stop damage with or without WS' assistance, WS' participation in carrying out the action will not affect the environmental status quo. In some situations, however, certain aspects of the human environment may actually benefit more from WS' involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity, WS' management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS' involvement may actually have a *beneficial* effect on the human environment when compared to the environmental status quo in the absence of such involvement.

2.3 ISSUES ANALYZED IN DETAIL

The following are issues that have been identified as areas of concern requiring consideration in this EA:

- Effects on white-tailed deer populations, regulated deer hunting, and aesthetics;
- Effects on non-target and other wildlife species, including threatened and endangered species;
- Effects on human health and human safety.

2.3.1 Effects on White-tailed Deer Populations

There are concerns that the proposed action or any of the alternatives would result in the reduction of local deer populations or could have a cumulative adverse impact on regional or statewide populations. Where deer pose damage problems in various habitats and where populations of damaging species have exceeded acceptable levels, the ODW supports a deer population management strategy of reduction rather than extirpation. In other instances (e.g., at airports), the presence of individual animals in a given locale can present unacceptable damage or risk to local habitats or humans. In these instances, the ODW considers reduction or elimination of risk of damage to be an integral part of wildlife management programs. The extent to which each of the alternatives contributes towards this strategy is considered a positive impact.

2.3.1.1 Effects on Regulated White-tailed Deer Hunting

Some people may be concerned that WS' deer removal activities would affect regulated deer hunting by significantly reducing local deer populations. Areas where WS is requested to assist with WDDM are generally areas where hunting is not allowed, even though hunting may be legal in accordance with ODW regulations. Local ordinances may restrict hunting or firearm use, while landowners may restrict all or some hunting on their own properties. While WS may recommend that land owners utilize hunters to reach their populations goals in certain situations, it is the land owner/manager's prerogative whether or not to allow hunting on their land. Impacts to the deer population, on the whole, will be evaluated under each alternative in Chapter 4.

2.3.1.2 Effects on Aesthetic Values

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. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

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

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 stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship with animals and may take the form of direct consumptive use (using up 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 benefitting 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).

WS recognizes that all wildlife has aesthetic value and benefit. WS only conducts WDDM at the request of the affected home/property owner or resource manager. If WS received requests from an individual or official for WDDM, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions would be necessary. Management actions would be carried out in a humane and professional manner in accordance with applicable local, state and federal regulations/laws.

2.3.2 Effects on Non-target and other Wildlife Species, including Native Flora and Threatened and Endangered Species

There are concerns among members of the public and wildlife professionals, including WS, that there is the potential for control methods used in the proposed action or any of the alternatives to inadvertently capture or harm non-target animals or potentially cause adverse impacts to non-target species populations, particularly T&E species. Special efforts are made to avoid affecting T&E species through biological evaluations of the potential effects and the establishment of SOPs. WS's SOPs include measures intended to eliminate or reduce the effects on non-target species populations and are described in other sections of this EA.

Threatened and Endangered species lists for the 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 WDDM 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.

Many property owners experience substantial damage to landscaping and vegetation from deer. These people are concerned whether the proposed action would reduce such damage to more acceptable levels. Some people are also concerned that high deer populations cause excessive damage to the native vegetation and subsequently adversely impact the natural ecosystem and other species of wildlife, including state and federally listed threatened and endangered species, whose habitat is destroyed by deer over-browsing. These people are concerned as to whether the proposed action or any of the alternatives would reduce such damage to acceptable levels.

2.3.3 Effects on Human Health and Human Safety

A common concern is whether the proposed action or any of the alternatives pose an increased threat to public and pet health and safety. In particular, there is concern that the methods of deer removal (e.g., sharpshooting) may be hazardous to people and pets. Another concern is that high deer populations pose a threat to human health and human safety through the potential for deer-vehicle collisions, deer-aircraft collisions, and the spread of disease.

Firearm use is a very sensitive issue that could raise public concern because of public safety issues related to firearms misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an annual firearms safety and use training program prior to the use of firearms in the conduct of official duties (WS Directive 2.615). WS employees who use 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. Drug testing is also conducted prior to employment and at random intervals throughout employment.

2.4 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.4.1 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 as large as the State of Ohio would meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other regulatory agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. Although WS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a damage problem has become intolerable to the point that they request assistance from WS.

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

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

2.4.2 Cost Effectiveness of Deer Damage Management

A formal, monetized cost benefit analysis is not required to comply with the NEPA requirements for EAs. Consideration of this issue may not be the driving factor when developing site-specific management strategies. The cost of management may sometimes be secondary because of overriding environmental, legal, human health, human safety, animal welfare, and/or other concerns. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. However, the cost effectiveness of methods and the effectiveness of methods are linked. Methods determined to be most effective to reduce damage and threats to human safety caused by deer and that prove to be the most cost effective would generally receive the greatest application. As part of an integrated approach, evaluation of methods would continually occur to identify those methods that are most effective at resolving damage for specific circumstance where deer are causing damage or pose a threat.

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

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

If WS donates wild meat for human consumption, WS' policies pertaining to the testing or labeling would be followed in order to address potential health concerns. Wild game donated for human consumption may be tested for exposure to substances such as organophosphate and carbamate insecticides, lead, mercury, arsenic, organochlorines, and organic chemicals prior to distribution. The entity selecting the capture/euthanize and donation for charitable consumption program would be responsible for all costs associated with legal and appropriate donation for human consumption.

Stewart and Veverka (2011) documented that white-tailed deer that were shot with lead ammunition in the head or extreme upper neck in sharpshooting situations showed no deposition of lead fragments in the meat of the animals that would have been processed for human consumption. Lower neck shots do frequently experience lead fragmentation in the loin muscle and the authors recommend removing the loins prior to processing to ensure that these fragments were not ingested. WS' personnel are trained to shoot and target the head and upper neck of white-tailed deer when practical.

2.4.4 Effects on Migratory Birds from the Use of Lead (Pb) Ammunition

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

The removal of white-tailed deer by WS using firearms in Ohio would occur primarily with the use of rifles. However, the use of shotguns or handguns could be employed to remove deer in limited situations.

Deer that are removed using firearms would occur within areas where retrieval of carcasses for proper disposal is highly likely. With risks of lead exposure occurring primarily from ingestion of bullet fragments, the retrieval and proper disposal of deer carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead that may be contained within the carcass.

Since those deer removed by WS using firearms could be lethally removed by other entities using the same method in the absence of WS' involvement, WS' assistance with removing deer would not be additive to the environmental status quo. The proficiency training received by WS' employees in firearm use and accuracy would increase the likelihood that deer were lethally removed humanely in situations that ensure accuracy and that misses occur infrequently, which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. Based on current information, the risks associated with lead projectiles that could be deposited into the environment from WS' activities due to misses, the projectile passing through the carcass, or from deer carcasses that may be irretrievable would be below the level that could pose risk of lead exposure to migratory birds.

2.4.5 WS's Impact on Biodiversity

WS WDDM is not conducted to eradicate native deer populations. WS operates according to international, federal, and state laws and regulations enacted to ensure species viability. In addition, any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. The impacts of the current WS program on biodiversity are minor and not significant nationwide, statewide, or region wide. WS operates on a relatively small percentage of the land area of the state, and the WS removal of deer analyzed in this EA is a small portion of the total population and insignificant to the viability and health of the population.

2.4.6 Humaneness of Methods to be Employed

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 . . ." (American Veterinary Medical Association (AVMA) 2013). Because suffering carries with it the implication of a time frame, a case could be made for " . . . little or no suffering where death comes immediately . . ." (CDFG 1991), such as shooting.

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

The AVMA states "... euthanasia is the act of inducing humane death in an animal" and that "...that if an animal's life is to be taken, it is done with the highest degree of respect, and with an emphasis on making the death as painless and distress free as possible" (AVMA 2013). Additionally, euthanasia methods should minimize any stress and anxiety experienced by the animal prior to unconsciousness." Although use of euthanasia methods to end an animal's life is desirable, as noted by the AVMA, "For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible" (AVMA 2001).

AVMA (2013) notes, "While recommendations are made, it is important for those utilizing these recommendations to understand that, in some instances, agents and methods of euthanasia identified as appropriate for a particular species may not be available or may become less than an ideal choice due to differences in circumstances. Conversely, when settings are atypical, methods normally not considered appropriate may become the method of choice. Under such conditions, the humaneness (or perceived lack thereof) of the method used to bring about the death of an animal may be distinguished from the intent or outcome associated with an act of killing.

Following this reasoning, it may still be an act of euthanasia to kill an animal in a manner that is not perfectly humane or that would not be considered appropriate in other contexts. For example, due to lack of control over free-ranging wildlife and the stress associated with close human contact, use of a firearm may be the most appropriate means of euthanasia. Also, shooting a suffering animal that is in extremis, instead of catching and transporting it to a clinic to euthanize it using a method normally considered to be appropriate (e.g., barbiturates), is consistent with one interpretation of a good death. The former method promotes the animal's overall interests by ending its misery quickly, even though the latter technique may be considered to be more acceptable under normal conditions (Yeates 2010). Neither of these examples, however, absolves the individual from his or her responsibility to ensure that recommended methods and agents of euthanasia are preferentially used."

WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology and funding. SOPs (Section 3.6.1) used to maximize humaneness are listed in this EA. As appropriate, WS euthanizes live animals by methods recommended by the AVMA (2013) or the recommendations of a veterinarian, even though the AVMA euthanasia methods were developed principally for companion animals and slaughter of food animals, and not for free-ranging wildlife.

WS and the National Wildlife Research Center (NWRC) 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. WS supports the most humane, selective, and effective damage management techniques, and would continue to incorporate advances into program activities.

2.4.7 WDDM Should Not be Taxpayer Responsibility

There may be concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based. Federal, state, and local officials have decided that wildlife

damage management should be conducted by appropriating funds. WS was established by Congress as the agency responsible for providing wildlife damage management to the people of the US. Wildlife damage management is an appropriate sphere of activity for government programs, because aspects of wildlife damage management are a government responsibility and authorized by law. In Ohio, funds to implement wildlife damage management activities and programs are derived from a number of sources, including, but not limited to federal, state, county and municipal governments/agencies, private organizations, corporations and individuals, homeowner/property owner associations, and others, under CSAs and/or other agreement documents and processes. A minimal federal appropriation is allotted for the maintenance of a WS program in Ohio. The remainder of the WS program is mostly fee-based. Technical assistance is provided to requesters as part of the federally- funded activities, but the majority of direct management assistance in which WS' employees perform damage management activities is funded through CSAs between the requester and WS.

2.4.8 WDDM Should be Managed by Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce deer damage for property owners/managers or property owners/managers could attempt to reduce their own damage problems. Some property owners/managers 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/managers 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/wildlifedamage).

2.4.9 Global Climate Change/Greenhouse Gas Emissions

The WS program activities that may result from the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of any of the alternatives. The alternatives would meet requirements of applicable federal laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance.

CHAPTER 3. ALTERNATIVES

3.1 INTRODUCTION

This chapter consists of six parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail, 3) a description of Integrated Wildlife Damage Management, 4) WDDM methods available for use or recommendation by WS in Ohio, 5) alternatives considered but not in detail with rationale, and 6) SOPs for WDDM.

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), and a review of the previous white-tailed deer EA *"White-tailed Deer Damage Management in Ohio."* The three alternatives analyzed in detail are:

Alternative 1 – Integrated Deer Damage Management Program (Proposed Action/No Action)

Alternative 2 – Non-lethal Deer Damage Management only by WS

Alternative 3 – No Deer Damage Management by WS

3.2 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

3.2.1 Alternative 1. Integrated Deer Damage Management Program (Proposed Action/No Action)

Under this alternative, WS would continue the current program that administers an Integrated Wildlife Damage Management (IWDM) approach to alleviate deer damage to agriculture, property, natural resources, human health, and human safety in Ohio. An IWDM approach would be implemented on all private and public lands of Ohio where a need exists, a request for assistance is received, and funding is available. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, other species, and the environment. Under this action, WS would provide TA and operational damage management, including non-lethal and lethal management methods, by applying the WS Decision Model (Figure 3, Section 3.3.6) (Slate et al. 1992). When appropriate, habitat modifications, harassment, repellants, and physical exclusion could be recommended and utilized to reduce deer damage. In other situations, deer would be removed as humanely as possible, by sharpshooting or live-capture followed by euthanasia, under permits issued by the ODW. 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 there could be instances where application of lethal methods alone would be the most appropriate strategy. Appendix B describes the methods available for recommendation and use by WS under this alternative. All WDDM would be consistent with other uses of the area and would comply with federal, state, and local laws and necessary permits.

3.2.2 Alternative 2. Non-lethal Deer Damage Management Only by WS

This alternative would require WS to use and recommend non-lethal methods only to resolve all deer damage problems. Requests for information regarding lethal management approaches would be referred to ODW, local animal control agencies, or private businesses or organizations. Persons experiencing deer damage could still resort to lethal methods or other methods not recommended by WS, use contractual services of private businesses that were available to them, or take no action. Property owners or managers may choose to implement WS' non-lethal recommendations on their own or with the assistance of WS, implement lethal methods on their own, or request assistance (non-lethal or lethal) from a private or public entity other than WS. Appendix B describes a number of non-lethal methods available for recommendation and use by WS under this alternative.

3.2.3 Alternative 3. No Deer Damage Management by WS

This alternative would eliminate WS involvement in all WDDM activities. WS would not provide operational WDDM or TA, and requestors of WS services would have to conduct their own WDDM without WS input. Information on WDDM methods would still be available to producers and property owners through other sources such as ODW, extension service offices, or pest control organizations.

Persons experiencing deer damage could continue to resolve damage by employing those methods legally available. All methods described in Appendix B would be available for use by persons experiencing deer damage. Lethal methods require permitting from the ODW.

3.3 DEER DAMAGE MANAGEMENT STRATEGIES AND METHODOLOGIES AVAILABLE TO WS

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

3.3.1 Integrated Wildlife Damage Management

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 a 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., no feeding policy), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, or any combination of these techniques, depending on the circumstances of the specific damage problem. WS supports and implements the IWDM approach (WS Directive 2.105) to reduce damage through the WS Decision Model (Slate et al. 1992).

3.3.2 Technical Assistance (TA) Recommendations

TA is information, demonstrations, and advice on available and appropriate wildlife damage management methods. TA is generally provided during on-site visits or verbal consultations with the requester. WS personnel may provide TA such as general information, instructional sessions and demonstrations on available WDDM techniques. TA may include information on the proper use of devices (e.g., pyrotechnics, exclusion devices, etc.), habits and biology, habitat management, exclusion, and animal behavior modification.

In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Generally, several management strategies are described to the requestor for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application. TA may require substantial effort by WS personnel in the decision making process, but the actual work is the responsibility of the requestor.

Under APHIS NEPA implementing regulations, TA 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 wildlife damage problems.

3.3.3 Direct Operational Damage Management Assistance

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

This is the implementation or supervision of damage management activities by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through TA alone, and when Agreements for Control or other comparable instruments provide for WS direct damage management. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve conflicts.

3.3.4 Educational Efforts

Education is an important element of WS's program activities because wildlife damage management is about finding compromise or co-existence 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 and demonstrations are provided to farmers, homeowners, 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 updated on recent developments in damage management technology, laws and regulations, and agency policies.

3.3.5 Research and Development

The National Wildlife Research Center (NWRC) functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. NWRC scientists work closely with wildlife managers, researchers, field specialists and others to develop and evaluate wildlife damage management techniques. NWRC scientists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

3.3.6 WS Decision Making

WS personnel use a methodical thought process for evaluating and responding to damage complaints and requests for assistance that are depicted by the WS Decision Model described by Slate et al. (1992) (Figure 1). WS personnel are frequently contacted after requesters have tried or considered nonlethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem, and then evaluate the appropriateness and availability (legal and administrative) of other strategies and methods based on biological, economic, and social considerations. Following this evaluation, the methods deemed to be practical for the situation are developed into a management strategy. After the management strategy has been implemented,

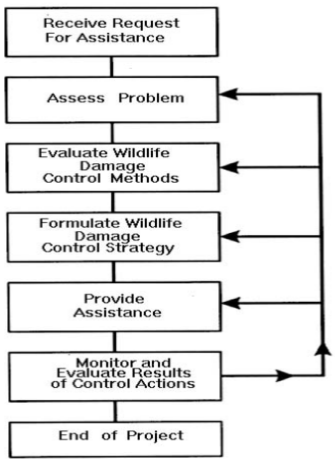

Figure 1. WS Decision Model, as presented by Stale et al. (1992), for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management may be ended. In some cases, continual application of effective wildlife damage management activities is necessary to relieve damage. 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 ongoing damage management strategy. The Decision Model is not necessarily a written process, but a mental problem-solving process common to most, if not all professions.

3.3.7 Community Based Selection of a WDDM Program

The WS program in Ohio follows the "co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides TA regarding the biology and ecology of deer and effective, practical, and reasonable methods available to reduce deer damage to local requesters. This includes non-lethal and lethal methods. WS and other state and federal wildlife or wildlife damage management agencies may facilitate discussions at local community meetings when resources are available. Resource owners/managers and others directly affected by deer damage or conflicts in Ohio have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Local authorities decide which methods should be used to solve a wildlife/human conflict. These decision makers include community leaders, private property owners/managers, and public property owners/managers.

The authority that selects damage management actions for the local community might be a mayor, city council, common council, park board, or for a homeowner or civic association would be the President or the President's or Board's appointee. These individuals are often elected residents of the local community who oversee the interests and business of the local community. These individuals would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision making. Identifying the authority that selects damage management actions for local business communities is more complex because the lease may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing board. WS would provide TA to the local community or local business community authority and recommendations to reduce damage. Direct damage management would be provided by WS if requested by the local community authority, funding was provided, and the requested direct damage management was consistent with WS recommendations, policy, and federal and state laws.

3.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

3.4.1 Lethal Deer Damage Management Only By WS

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

3.4.1.1 Live Trap and Relocation

Under this alternative WS could live capture deer using cage-type live traps or immobilizing drugs administrated by dart gun and then relocate the captured deer to another area. Due to concerns about spread of disease, ODW will not authorize the relocation of deer. Therefore, since ODW will not authorize the action, WS will not consider it further.

3.4.1.2 Use of Immunocontraceptives

Immunocontraceptives (or other contraception agents) may only be used legally for research purposes on wild deer populations in Ohio. This use must be authorized by federal regulatory agencies and the ODW (ORC 1501:31-25-01 (K)). Currently, the ODW does not authorize the use of immunocontraceptives for deer population management; therefore, WS will not consider it further at this time.

3.5 STANDARD OPERATING PROCEDURES FOR WILDLIFE DAMAGE MANAGEMENT TECHNIQUES

3.5.1 Standard Operating Procedures (SOPs)

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

- The WS' Decision Model thought process is used to identify effective WDDM strategies and their effects.
- Drugs are used according to the Drug Enforcement Administration (DEA), FDA, and WS' program policies and directives and procedures are followed that minimizes pain.
- All controlled substances are registered with DEA or FDA, as appropriate.
- WS' employees would follow approved procedures outlined in WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs.
- WS' employees that use controlled substances are trained to use each material and are certified to use controlled substances under Agency certification program.
- Controlled substance use, storage, and disposal conform to label instruction and other applicable laws and regulations, and Executive Order 12898.
- Material Safety Data Sheets for controlled substances are provided to all WS' personnel involved with specific WDM activities.
- Research is being conducted to improve WDDM methods and strategies so as to increase selectivity for target species, to develop effective non-lethal control methods, and to evaluate non-target hazards and environmental effects.
- Management actions would be directed toward localized populations or groups and/or individual offending animals, dependent on the magnitude of the problem.

3.5.2 Additional Standard Operating Procedures Specific to the Issues

The following is a summary of additional SOPs that are specific to the issues listed in Chapter 2 of this document.

Effects on Target Deer Populations, Regulated Hunting, and Aesthetics

- WS' removal is monitored by comparing numbers of deer killed with overall populations or trends in populations to assure the magnitude of removal is maintained below the level that would cause significant adverse effects to the viability of populations.
- Euthanasia methods approved by the AVMA are used as often as practical to minimize suffering.
- Whenever practicable, WS' personnel perform components of deer removal activities, such as shooting and euthanizing, away from public view.
- In addition, deer carcasses are concealed from public view when they must be transported through areas of human habitation, in an effort to reduce adverse effects on the aesthetic quality of the environment.

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

- WS' personnel are trained and experienced to select the most appropriate method to remove deer causing damages while minimizing effects on non-targets.
- WS uses methods that are highly selective (e.g., shooting) or methods that allow for the release of any non-target unharmed (e.g., live traps). WS has policy mandating traps be checked at designated intervals to reduce the possibility of non-target take.

Effects on Human Health and Human Safety

- WS' personnel are trained and supervised in the use of WDDM methods, including firearms, traps, and immobilization drugs to ensure that they are used properly and according to policy. WS' personnel using firearms will routinely receive firearms safety training according to WS' policy.

CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information for making informed decisions on the WDDM program outlined in Chapter 1, and the issues and affected environment discussed in Chapter 2. This Chapter consists of: 1) analysis of environmental consequences, 2) analysis of each alternative against the issues considered in detail, and 3) summary of WS's impacts. The environmental consequences of each alternative are analyzed in comparison with the no action alternative (Alternative 1) to determine if the real or potential effects would be greater, lesser, or the same (Table 2).

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 the Council on Environmental Quality (CEQ) (1981).

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.

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

Cumulative Effects: 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.

4.1 Alternative 1. Integrated Deer Damage Management Program (Proposed Action/No Action)

4.1.1 Effects on White-tailed Deer Populations

The current program removes only a very small number of deer from the statewide population in Ohio. While annual number of deer removed by WS will likely be much lower, WS expects that no more than 3,000 deer would be lethally removed annually under permits issued by the ODW while conducting direct damage management activities. Therefore, a maximum removal of 3,000 deer was used to analyze WS potential impacts to the statewide deer population in Ohio.

White-tailed Deer Population Analysis

The ODW is responsible for the management of resident, protected wildlife species, including deer. ODW collects and compiles information on white-tailed deer population trends and uses this information to manage deer populations. Over the past several years, the annual hunter harvest has ranged from 175,801 to 239,475 deer with an average of 209,087 deer harvested per year.

The ODW issues deer damage control permits (DDCPs) to landowners to resolve damage problems. Over the period of 2010-2015, ODW issued an annual average of 1,249 deer damage control permits (range 1,097-1,411 permits/year) to landowner/managers to help address problems with damage to agriculture (ODW 2015). These permits resulted in the average annual removal of 5,299. In general, deer removal under DDCPs to alleviate agricultural damage is conducted/managed by the landowner. Instances where WS is requested to provide assistance with deer removal to resolve agricultural damage (e.g., crop damage) are rare. WS is more likely to become involved in deer removals to protect agricultural resources in situations where there is a risk of disease transmission between deer and livestock (e.g., TB). In these situations, WS could be requested to assist with capture and sampling of deer, or removal of deer from a select area where the disease has been detected (see below).

In addition to issuing DDCPs to resolve agricultural damage, the ODW issues DDCPs to parks and in urban/suburban areas to help resolve problems with natural resource, property damage and other problems associated with high local deer populations. These areas tend to be locations where use of hunting to reduce deer numbers has been ruled out because of factors such as community and/or landowner concerns regarding safety, conflicts with other site uses, or security requirements for the site associated with

traditional hunting methods. Data on the exact number of deer taken per year under these permits is not available, but is estimated to be approximately 3,000 deer per year. This is the type of damage management situation where WS typically receives a request for assistance with deer removal.

The number of deer removed by WS, removed by non-WS personnel under permits issued by the ODW, and harvested by hunters in Ohio is illustrated in Table 3 (ODW 2011, 2012, 2013, 2014, 2015). The maximum number of deer removed by WS in any those years was 305 deer. WS defines magnitude as a measure of the number of animals lethally removed in relation to their abundance. Using the harvest data and the potential annual lethal removal of up to 3,000 deer by WS, the magnitude is considered low for WS' proposed deer removal.

Table 1. Deer Harvest Data for Hunters, Depredation Permits, and WS Removal in Ohio from 2010-present.

ODW Season	**2010-2011**	**2011-2012**	**2012-2013**	**2013-2014**	**2014-2015**
# Removed During State Regulated Harvest Season	**239,475**	**219,748**	**218,910**	**191,503**	**175,801**
# Removed Under ODW Deer Damage Control Permits (Agriculture)[a]	**5,878**	**5,741**	**5,710**	**4,923**	**4,244**
# Removed Under ODW Deer Damage Control Permits (Urban/Suburban)[a]	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**
Total Harvest	**248,353**	**228,489**	**227,620**	**199,426**	**183,045**
WS Removal in Ohio	**20**	**305**	**212**	**99**	**128**
WS Removal as % of Total Harvest	**.008%**	**.133%**	**.093%**	**.050%**	**.071%**
WS Proposed Removal (3000) as % of Total Harvest	**1.2%**	**1.3%**	**1.3%**	**1.5%**	**1.6%**

[a] Includes WS Removal

Although the deer management program is not expected to have a substantial impact on deer populations, there may be situations, such as deer removal from urbanized locations or airports that have deer contained within a formidable fence, where very small and localized populations are substantially reduced. Such actions would only be conducted in accordance with landowner management objectives and under authorization by the ODW.

In addition to WS' intentional removal of deer for DDM, WS also conducts some damage management activities which pose a risk of unintentional death of a deer, specifically projects to manage damage by feral swine, coyotes, red fox, feral dogs, wolf-dog hybrids and exotic carnivores (USDA 2013). Unintentional deer removal from other WS programs is not anticipated to result in the death of more than one or two individuals per year and will not raise WS cumulative deer removal to over 3,000 deer per year.

Deer removal efforts may also be conducted to manage herd health. The removal of diseased, free- ranging deer would ultimately make for a healthier population where deer would readily re-establish in locations where habitat exists. Successful suppression of deer diseases that are easily transmitted would benefit deer populations in the long term and would protect the interests of concerned groups (hunters, wildlife watchers, wildlife managers, and captive cervid owners) (WDNR 2003). Although hunters do not typically find government culling popular, recent research has demonstrated evidence that culling localized deer populations can maintain low disease prevalence and minimize impacts to recreational deer harvest (Manjerovic et al. 2014). In the event of a disease outbreak (e.g., TB, CWD), the ODW might decide to remove deer for disease surveillance or to reduce the likelihood of disease transmission to livestock and the rest of the state deer herd. At the request of ODW, WS could assist with this effort which is not anticipated to result in WS removing more than 1,000 deer per year above the maximum of 3,000 discussed above. Similarly, WS may be asked to assist with the depopulation of captive deer herds where CWD or other diseases are a concern to regulatory agencies. Such removals would be conducted at the request of ODW and/or the appropriate management authority under appropriate authorizations and permits. Complete removal of a captive deer herd would not impact the statewide population of wild, free-ranging deer as captive herds are typically isolated. Wildlife Services' assistance with removal of deer from captive cervid farms is not included in the deer population impact analysis because captive cervids do not contribute to and are not included in counts of the free-ranging deer population. Projects conducted to minimize disease in captive cervids are likely to have beneficial impacts because it minimizes the risk of disease transmission to the free-ranging deer population.

Effects on Aesthetic Values

Some members of the public have expressed opposition to the killing of any deer. Under this Proposed Action Alternative, some lethal control of deer 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 deer 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.

Public reaction would be variable and 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. The IWDM approach, which includes non-lethal and lethal methods as appropriate, provides relief from damage or threats to human health or safety to those people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by problems and threats to human health or safety caused by deer insist upon their removal from

the property or public location when the wildlife acceptance capacity is reached or exceeded. Some people will have the opinion that deer should be captured and relocated to a rural area to alleviate damage or threats to human health or safety. Some people would strongly oppose removal of the deer regardless of the amount of damage. Individuals not directly affected by the threats or damage may be supportive, neutral, or totally opposed to any removal of deer from specific locations or sites. Some people that totally oppose lethal damage management feel that deer should never be killed and want WS to teach tolerance for deer damage and threats to public and pet health or safety.

Effects on Regulated White-tailed Deer Hunting

Lethal removal of deer by WS under the Proposed Action would only occur after a permit has been issued by the ODW to remove deer that are causing damage. This activity would result in reduced deer densities on and adjacent to project areas, hence, slightly reducing the number of deer that may otherwise be available to hunters during hunting seasons. The impact of this, however, is expected to be minimized due to:

- The number of deer expected to be lethally removed by WS is minimal (< 2.0%) when compared to the number taken by hunters across the state.
- The number of deer expected to be removed by WS would not cause a statewide deer population reduction.
- WDDM often takes place in areas where hunting is not allowed due to concerns related to human safety (e.g., urban parks/preserves).

In most cases where WS conducts deer removal projects, the landowners or land administrators have not permitted regulated deer hunting due to safety restrictions. This would have only a minimal impact on deer hunting, since the land was not accessible to hunters. In fact, it is possible that WS' activities could push non-harvested deer from restricted sites into locations accessible to hunters. WS may recommend regulated hunting to landowners, but it is ultimately the landowner's decision as to what methods of deer damage management they want to employ on their land. In cases where WS is conducting captive herd depopulation for disease reasons, removals would not affect hunter opportunities to harvest free-ranging deer, and may prevent the spread of disease to wild populations.

4.1.2 Effects on Non-target and Other Wildlife Species, Including Native Flora and Threatened and Endangered Species

WS personnel are trained and experienced to select the most appropriate tools and methods for taking target animals and excluding non-targets. Methods proposed for use by WS for deer management are highly selective, especially considering WS's use of advanced technology, such as Forward Looking Infrared (FLIR) and night vision. Use of live-capture devices would allow for release of non-target individuals unharmed. WS take of non-target species is expected to be minimal or nonexistent. Other wildlife populations would not be negatively affected, except for the occasional scaring effect from the sound of gunshots. In these cases, birds and other mammals may temporarily leave the immediate vicinity of shooting, but would most likely return after conclusion of the action.

WS has reviewed the list of T&E species in Ohio (Appendix C) and has determined that the Proposed Action will have no effect on federal T&E species or their critical habitat. The methods used and locations of WDDM do not directly interfere with the viability of any listed species in Ohio. WS could positively benefit T&E species by reducing deer browsing damage to listed plant species and to habitat that is being used by T&E species. Engeman et al. (2014) documented the success of a WS deer management program had on the browse rates of sensitive species in forest preserves around Chicago. Browse rate of sensitive species were reduced as much as 54% subsequent to deer herd reduction (Engeman et al. 2014). This alternative has the greatest potential of reducing the damaging effects that deer are having on native flora and fauna including the recovery of state and federally listed T&E species to acceptable levels since all available WDDM methods, tools, and methodology would be available for consideration and use.

4.1.3 Effects on Human Health and Human Safety

The only pesticides that might be used or recommended by WS would be non-lethal repellents such as Hinder®, Deer Away®, and others that are registered with the Ohio Department of Agriculture (ODA). Such chemicals must undergo rigorous testing and research to prove safety, and low environmental risks before they would be registered by the EPA or FDA. Any operational use of chemical repellents would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations which are established to avoid adverse effects on the environment. Following labeling requirements and use restrictions are a SOP that would assure that use of registered chemical products would avoid significant adverse effects on human health. Since these methods could be used without WS' assistance, use by WS would not contribute to any adverse cumulative impacts.

Drugs used in capturing, sedating, handling, and euthanizing deer for wildlife management purposes may 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 hazard management programs may choose to avoid capture and handling activities that utilize immobilizing drugs within a specified number of days prior to the hunting season for the deer to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. 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 season to avoid the chance that they would be consumed as food while still potentially having immobilizing drugs in their systems. Deer that have been drugged and released would be ear tagged or otherwise marked to alert hunters that they should contact state officials before consuming the animal.

- 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. When requested, WS may work to reduce deer populations to reduce deer-vehicle collisions. This alternative would provide the most efficient means of providing relief for deer-vehicle collisions.

WS' lethal methods pose minimal or no threat to human or pet health or safety. Firearm safety precautions are followed by WS when conducting damage management and WS complies with all laws and regulations governing the lawful use of firearms. WS' personnel are trained and given refresher courses to maintain awareness of firearm safety and handling as prescribed by WS' policy. Shooting is selective for target species. WS could use firearms to humanely euthanize deer captured 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 their presence.

This alternative has the greatest potential of reducing threats to public health and safety since all available WDDM methods, tools, and methodology would be available for consideration and use.

4.2 Alternative 2. Non-lethal Deer Damage Management Only by WS

4.2.1 Effects on White-tailed Deer Populations

Only non-lethal methods would be used by WS to manage deer damage under this alternative. Although the methods employed by WS would not be intended to result in the death of the animal, some methods, such as live-capture and anesthesia can result in injury or death of target animals despite the training and best efforts of management personnel. This type of take is likely to be limited to a few individuals and would not adversely impact deer populations.

Although WS lethal removal of deer would not occur, it is likely that without WS conducting some level of lethal WDDM activities, private WDDM efforts would increase. Cumulative impacts on deer 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 WDDM.

Resource owners may also obtain special permits from the ODW to allow them to shoot deer outside of the regular hunting season and in those areas where regulated hunting is not allowed. Deer populations could continue to increase where hunting pressure is low or when an insufficient number of deer are removed under special permits issued by ODW. Some local populations of deer would temporarily decline or stabilize where hunting pressure and permitted removal activities were adequate. Some resource owners may take illegal, unsafe, or environmentally harmful action against local populations of deer out of frustration or ignorance.

Effects on Aesthetic Values

The impacts of this alternative to stakeholders would be variable depending upon the effectiveness of non-lethal methods, the damage management efforts employed by resource owners, the stakeholders' values toward deer, and compassion for their neighbors. 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. Although WS would not perform any lethal activities under this alternative, other

private entities would likely conduct WDDM activities similar to those that would no longer be conducted by WS, which means the cumulative effects would be similar to the Proposed Action Alternative.

There is also the possibility that deer damage may not be reduced, regardless of the impacts on the deer population. The effectiveness of this alternative without integrated management methods is unknown, and could result in lower aesthetic quality where continuing deer damage is undesirable. If non-lethal damage control efforts are ineffective, some people would have a negative view of the absence of native plants, the fencing/netting around ornamental plants and gardens and possibly the higher number of deer carcasses along the roadways. Others would oppose this alternative because they believe resource owners would use illegal, inhumane, or environmentally unsafe methods to mitigate their damages on their own.

Effects on Regulated White-tailed Deer Hunting

WS would have no direct impact on regulated deer hunting since WS would not lethally remove deer under this alternative. However, resource owners may remove deer under special permits issued by ODW resulting in impacts similar to the proposed action. Cumulative impacts on regulated harvest would be variable depending upon actions taken by affected landowners/resource managers and the level of training and experience of the individuals removing deer via special permits.

4.2.2 Effects on Plants and Other Wildlife Species, Including T&E Species

WS will not have any direct impact on non-target species. 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's 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 the harassment devices, but would most likely return after conclusion of the action. Animals may also become habituated to the harassment techniques if employed improperly. 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 work. As stated above, frustrated individuals may use unsafe or illegal methods which may increase risks to other listed species. Risks to T&E species may be lower with this alternative than with Alternative 3 because WS could still advise individuals as to the potential presence of state and federally-listed species in their area and could facilitate consultation with the appropriate agency.

Although technical assistance provided by WS might lead to more selective use of control methods by private parties, 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 which could result in unknown risks to non-target species, the environment, or other humans. While WS could only provide non-lethal assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the proposed action alternative but with potentially greater associated risks.

4.2.3 Effects on Human Health and Human Safety

The effects of WS use of non-lethal methods would be similar to those described under the proposed action. In those situations where non-lethal methods are effective at reducing threats to human health and

human safety, impacts would be similar to the proposed action. In those situations where non-lethal methods were ineffective, impacts to human health and human safety could possibly remain the same or increase resulting in impacts similar to Alternative 3. Additionally, resource owners may attempt to lethally resolve deer damage problems through illegal use of methods, without WS expertise. In these situations there may be some risk to human or pet health or safety from improper or inexperienced use of these methods.

4.3 Alternative 3. No Deer Damage Management by WS

4.3.1 Effects on White-tailed Deer Populations

No WDDM activities would be conducted by WS under this alternative. The effects on deer populations could be reduced, stay the same, or increased depending on actions taken by others. Some resource owners may kill deer, or allow other hunters access to kill deer during the legal harvest season. Resource owners may also obtain special permits from the ODW to allow the removal of deer outside of the regular season and in those areas where regulated hunting is not allowed. Deer populations could continue to increase where hunting pressure was low or when an insufficient number of deer are removed under special permits issued by ODW. Some local populations of deer could temporarily decline or stabilize where hunting pressure and permitted removal activities were adequate. Some resource owners may take illegal, unsafe, or environmentally harmful action against local populations of deer out of frustration or ignorance. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the proposed action alternative. With regard to captive deer herds infected with CWD, less experienced personnel may have difficulty removing all deer in a fenced facility as this typically requires specialized equipment and expertise.

Effects on Aesthetic Values

The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. Resource owners receiving damage from deer would likely strongly oppose this alternative because they would bear the damage caused by deer. Some individuals would prefer this alternative because some groups believe it is morally wrong to kill or use animals for any reason and the damage to plants or landscaping is an acceptable cost for the benefit of potentially viewing more wildlife. Some people would support this alternative because they enjoy seeing deer, or having deer nearby. However, while WS would take no action under this alternative, other individuals or entities could, and likely would, conduct WDDM activities in the absence of WS.

Effects on Regulated White-tailed Deer Hunting

WS would have no direct impact on regulated deer hunting. However, resource owners may still remove deer under the same permits issued by ODW, resulting in impacts similar to the proposed action. Cumulative impacts on regulated harvest would be variable depending upon actions taken by affected landowners/resource managers and the level of training and experience of the individuals removing deer via special permits.

4.3.2 Effects on plants and other wildlife species, including T&E Species

Alternative 3 would not allow any WS WDDM in Ohio; therefore non-target species would not be taken by WS under this alternative. Private efforts to reduce or prevent damage 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 mechanical methods and chemical toxicants which could impact local non-target species populations, including some T&E species.

4.3.3 Effects on Human Health and/or Human Safety

Concerns about human health risks from WS's use of lethal methods would be alleviated because no such use would occur. Private efforts to reduce or prevent damage would be expected to increase. Risks to human health and/or human safety from lethal methods will be variable depending upon the training and experience of the individual conducting the WDDM. Hazards to humans and pets could be greater under this alternative if other individuals do not receive the same level of firearms and chemical immobilization training as WS personnel. It is hypothetically possible that frustration caused by the inability to alleviate deer damage could lead to illegal use of certain methods that pose hazards to pets and humans.

Table 2 summarizes the expected impacts of each of the alternatives on each of the issues.

Table 2. Comparison of Issues/Impacts and Alternatives

Issues/Impacts	***Alternative 1***	***Alternative 2***	***Alternative 3***
Effects on white-tailed deer populations, regulated hunting, and aesthetics	Local populations could be reduced and sustained at a lower level. No effect on statewide deer population, hunting opportunities, or long-term opportunities to view deer.	Populations would not be affected by WS. If resource owner conducts deer management, effect would be similar to Alternative 1.	Populations would not be affected by WS. If resource owner conducts deer management, effect would be similar to Alternative 1.
Effects on plants and other wildlife species, including T&E species	No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer.	No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer if non-lethal methods are effective.	No impact by WS. Positive impact to those species being negatively impacted by deer if resource owner implements damage reduction program.

Effects on Human Health and Human Safety	No probable direct negative effect. Positive effect from reduced deer strikes and disease transmission.	No probable direct negative effect. Risks could be greater if inexperienced entities attempt lethal methods.	No impact by WS. Probable increase in risks associated from deer strikes and disease transmission. Risks could be greater if inexperienced entities attempt lethal methods.

4.4 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.

No significant cumulative environmental impacts are expected from any of the three alternatives. Under the Proposed Action, the lethal removal of deer would not have a significant impact on overall deer populations in Ohio, but some local reductions may occur. Although some persons will likely be opposed to WS' participation in WDDM activities, the analysis in this EA indicates that WS IWDM program will not result in significant cumulative adverse impacts on the quality of the human environment.

4.4.1 Cumulative Impacts on Target, Non-target, and T&E Wildlife Species

Evaluation of the WDDM program activities relative to target, non-target and T&E species indicated that program activities will likely have no cumulative adverse effects on wildlife populations in Ohio.

WDDM program actions would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place. Those activities include, but are not limited to:

- Natural mortality of target, non-target, and T&E species
- Human-induced mortality of target and non-target species through hunting, deer damage management, disease, and other activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in wildlife population densities

All these factors play a role in the dynamics of wildlife populations. In many circumstances, WDDM is necessary to reduce damage when some or all of those elements have contrived to elevate deer populations or place deer at a juncture to cause damage to resources. WS' actions taken to minimize or eliminate damage are constrained as to scope, duration and intensity, for the purpose of minimizing or avoiding impacts to the environment. WS evaluates damage occurring, including other affected elements and the

dynamics of the damaging species; determines appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target, non-target, and T&E species.

The presence of hemorrhagic disease (HD) in Ohio and its impact on the deer population is a concern to some hunters in Ohio. According to the Southeastern Cooperative Wildlife Disease Study, deer death losses to HD usually represent less than 25% of the local population, but may reach 50% or more in some situations. However, there is no evidence that repeated HD outbreaks are a limiting factor for population growth. "Although die-offs of white-tailed deer due to hemorrhagic disease often cause alarm, past experiences have shown that mortality will not decimate local deer populations and that the outbreak will be curtailed by the onset of cold weather" (Southeastern Cooperative Wildlife Disease Study 2013). Because WS only removes deer under permits issued by the ODW, the effects of disease outbreak and damage management needs will likely be considered by the ODW before permits are issued.

No cumulative adverse impacts on target and non-target wildlife are expected from WS' WDDM actions based on the following considerations:

- **Historical outcomes of WS' WDDM programs on wildlife**

No cumulative adverse effects have been identified for target, non-target, and T&E species identified in this EA as a result of WDDM program activities implemented over time. WS continues to implement an integrated damage management program that adapts to the damage situation and the number of deer involved with causing the damage. WS only targets deer causing damage and only after a request for assistance is received. All program activities are coordinated with appropriate federal, state, and local entities to ensure WS' activities do not adversely impact the populations of any native wildlife species.

- **SOP strategies built into WS' WDDM program**

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

- **Current status of potentially affected wildlife species**

Natural and human-induced mortality patterns for target, non-target, and T&E species are expected to remain essentially unchanged in Ohio. As a result, no cumulative adverse effects are expected from repetitive WDDM programs over time.

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally remove mammals. As described in Appendix B, the lethal removal of 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 deer, the use of firearms is applied in such a way (e.g., caliber, bullet weight, distance) to ensure there is a safe backstop behind the target animal, such as an embankment. 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 deer 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 deer would not be additive to the environmental status quo since those deer removed by WS using firearms could be lethally removed by the landowners or other entities receiving a similar permit from the ODW 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 deer are lethally removed in a humane manner that ensures 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.

4.4.2 Summary of Cumulative Impacts

No significant cumulative environmental impacts are expected from any of the three alternatives including the Proposed Action. WS' management activities will not adversely impact protected flora and fauna in Ohio, including T&E species. Under the Proposed Action, the lethal removal of deer by WS would not have a significant impact on overall deer populations in Ohio, but some local reductions may occur.

No risk to human health or human safety is expected when services are provided and accepted by requesting individuals in Alternative 1 since only trained and experienced wildlife biologists and wildlife specialists would conduct and recommend WDDM methods. There is a potential slight increased risk to human safety when persons who reject WS' assistance and recommendations in Alternatives 1 and Alternative 2 and conduct their own WDDM activities, and when no WS' assistance is provided in Alternative 3. In all three alternatives, however, it would not be to the point that the impacts would be significant.

Under Alternative 3, management actions taken by non-federal entities would be considered the environmental status quo. In those situations where a non-federal cooperator has already made the decision to remove or otherwise manage mammals to stop damage with or without WS' assistance in Alternative 1, WS' participation in carrying out the action will not affect the environmental status quo. In some situations, dependent upon the skills and abilities of the non-federal entity, WS' involvement may actually have a beneficial effect on the human environment when compared to the environmental status quo in the absence of such involvement.

Although some persons will likely be opposed to WS' participation in management activities to reduce mammal damage, the analysis in this EA indicates that WS' WDDM program will not result in significant cumulative adverse impacts on the quality of the human environment.

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APPENDIX B: WHITE-TAILED DEER DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE OHIO WILDLIFE SERVICES PROGRAM

NONLETHAL METHODS:

Nonlethal preventative methods, such as habitat modification, physical exclusion, and animal behavior modification, are basic components of IWDM. Resource owners/managers may be encouraged to use these methods based on the level of risk, need, and professional judgment on their effectiveness and practicality. These methods include, but are not limited to:

Environmental/Habitat Modification: Environmental/Habitat Modification can be an integral part of IWDM. Wildlife production and/or presence are directly related to the type, quality and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain wildlife species. The property owner/manager is responsible for implementing habitat modifications. WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of IWDM strategies at or near airports to reduce problems by eliminating loafing, bedding and feeding sites. Generally, many problems on airport properties can be minimized through management of vegetation and water on areas adjacent to aircraft runways.

Physical Exclusion (Wildlife Fence): A fence around the area where deer are not desirable, like an airfield, can limit the entry of deer into the area. There are several types of fences that inhibit the movement of deer into protected areas if properly installed, including electric fencing, woven wire, and chain link fencing. The height of a fence required to exclude deer is a debated topic. One study reported that a 2.1-meter fence (7 feet) reduced deer/vehicle collisions by 44.3 to 83.9 percent along a New York Thruway (Smith, Coggin 1984). Although this is a clear reduction, this would not satisfy the objectives stated in 1.3.2. Dolbeer and Clearly recommend in a joint USDA/FAA airport manual, Wildlife Hazards Management at Airports, that a 10-foot chain link fence with barbed-wire outriggers should be installed to prevent mammal entry to an airport (Cleary, E. C. and Dolbeer, R. A. 1999). For the purpose of this EA, WS recommends a fence height of 12-feet, with an additional three feet buried below the ground, to exclude deer from the areas to be protected. However, other permanent fencing heights from 8 to 10- feet can be utilized and are effective (VerCauteren et al. 2006). Other types of non-permanent fencing can be utilized and are effective when deer tolerance is low. Examples are high tensile electric fencing at a height of 5 -feet as well as slanted configurations that give a 3-dimentinal appearance which makes the jump look higher or longer (VerCauteren et al. 2006).

Animal Behavior Modification: This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve use of pyrotechnics, propane cannons, sirens, flashing lights, dogs, and visual techniques to help deter or repel animals that cause loss or damage.

Auditory scaring devices: The proper use of frightening devices and harassment techniques including sirens, flashing lights, electronic distress sounds, pyrotechnics, propane exploders, dogs, and rubber projectiles fired from a shotgun could help reduce conflicts (Craven and Hygnstrom 1994). Used in the proper context, these devices can help keep deer away from conflict areas. Some disadvantages are that these methods can be labor intensive and expensive. Also, frightening methods must be continued indefinitely unless the deer population is reduced or excluded from the resource.

Pyrotechnics: Pyrotechnics are specialized fireworks that are shot out of a 12-gauge shotgun or starter's pistol to deter deer and other wildlife. To be successful, pyrotechnics should be carried by wildlife control personnel at all times and used whenever the situation warrants. Continued use of pyrotechnics alone may lessen their effectiveness.

Propane Cannons: Propane cannons are mechanical devices that use propane gas and an igniter to produce a loud explosive sound. Propane cannons are often suggested as effective frightening agents for deer (Craven and Hygnstrom, 1994), and have been used frequently in attempts to reduce crop damage and encroachment on airports. Research has shown that propane cannons detonated systematically at 8-10 minute intervals are effective in frightening deer away from protected areas for two days (VerCauteren et al. 2011). Motion-activated cannons however, detonate only when deer approach the area to be protected and have been shown to be effective up to 6 weeks (Belant et al 1996).

Repellents: There are several products and items that act as deer repellents but they fall into two basic types; contact and area (Craven and Hygnstrom, 1994). Contact repellents are those that are applied directly to plants that deer are feeding on. Deer are not "repelled" until they have eaten a portion of a treated plant. Contact repellents tend to be more effective, and expensive, than area repellents.

Area repellents repel by odor. They are applied, or hung, near areas where deer tend to feed. Besides several commercial products, objects like bags of human hair and bar soap can be used as area repellents. Area repellents tend to be less effective, but cheaper than contact repellents.

LETHAL METHODS:

When non-lethal preventive methods have proven ineffective or not practical, removals using lethal methods may become necessary. Depending upon the views of the owners/managers of the resources to be protected, and state and local laws, any, or all, of the following lethal methods can be used to minimize damage caused by white-tailed deer.

Sharpshooting: Studies have suggested that localized (deer) management (deer removal) is an effective tool where deer are causing undesired effects (McNutly, S. A. et al 1997). This study supported the hypothesis that the removal of a small, localized group of white-tailed deer would create an area of persistent, low density in the population. The goal of sharpshooting, conducted by WS, would be to reduce the deer density(ies) to the established WAC(s) for the site(s).

WS would conduct sharpshooting, with center-fire rifles or shotguns, during daylight or at night using spotlights or night-vision equipment, as necessary. Rifles would be equipped with noise suppressors to avoid disturbance to local residents, airport operations or other nearby functions and to facilitate success by minimizing the tendency of deer to flee from the sound of gunfire. Shots would be taken from elevated positions in tree stands, in the beds of vehicles or other vantage points. Elevated positions cause a downward angle of trajectory so that any bullets that inadvertently miss or pass through targeted deer will hit into the ground or into earthen embankments to minimize the risk of stray bullets that, otherwise, would present a safety hazard to people, pets, or property. WS personnel would strive for head and neck shots when shooting deer to achieve quick, humane kills. Bait may be used to attract deer to safe sites for shooting and to enhance success and efficiency. The venison from deer killed by WS would be, when possible, processed and donated for consumption, at one or more charitable organizations. WS, or their

cooperators, will be responsible for properly preparing deer and delivery to a USDA approved meat processor.

Only WS personnel, who have completed firearms safety training, have demonstrated skill and proficiency with the firearms used for deer removal, and have been approved for sharpshooting by the State Director of Ohio WS will participate in sharpshooting of deer.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. 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 prior to the use of firearms in the conduct of official duties and continuing education as prescribed by WS Directive 2.615. WS 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.

Forward Looking Infra-Red (FLIR) and Night Vision equipment are used in combination with shooting to remove deer at night or are used to conduct wildlife surveys. FLIR and night vision equipment allow personnel to view deer at night when deer are active and when human activities are minimal. This approach is often more selective when compared to other activities since WS' personnel are present on-site during application and target animals are identified prior to application. FLIR and night vision equipment could be used under the alternatives where appropriate.

Live Capture Followed by Euthanasia: White-tailed deer can be captured a number of different ways (Craven and Hygnstrom, 1994). Deer can be drugged with a dart gun fired by a trained person on the ground, in a vehicle, or from an elevated platform. Once recovered, darted deer can be euthanized at the recovery point or at another site.

Deer can be trapped using a baited cage trap or by using a clover or corral trap that deer can either walk into by themselves or by be driven into by people on foot or in vehicles. Trapped deer can be euthanized at the trap location or another site, if necessary. Deer can also be captured using nets. Drop nets and rocket/cannon nets can be used by baiting deer into a specific area and firing the rockets/cannons or dropping the net over the deer. This method can be used to catch multiple deer at one time. Nets can also be fired at individual animals using a net gun. The net gun can be fired from a person on the ground, in a vehicle, or from an elevated position. Netted deer can be euthanized at the capture site or another location, if necessary.

Recreational Hunting: WS may recommend white-tail deer hunting as a viable damage management method when deer can be legally hunted. A valid hunting license and other licenses or permits may be required by the ODW. This method provides sport and food for hunters and requires no cost to the landowner. See http://wildlife.ohiodnr.gov/hunting-trapping-and-shooting-sports/hunting-trapping-regulations/deer-hunting-regulations for more information on deer hunting in Ohio.

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

FE= Federal Endangered, FT= Federal Threatened, SE= State Endangered, ST= State Threatened, SC= State Species of Concern

		FE	FT	SE	ST	SC
PLANTS						
Running Buffalo Clover	*Trifolium stoloniferum*	X				
Lakeside Daisy	*Hymenoxys herbacea*		X			
Northern Monkshood	*Aconitum noveboracense*		X			
Eastern Prairie Fringed Orchid	*Platanthera leucophaea*		X			
Virginia Spiraea	*Spiraea virginiana*		X			
Small Whorled Pogonia	*Isotria medeoloides*		X			
FISH						
Ohio lamprey	*Ichthyomyzon bdellium*			X		
Northern brook lamprey	*Ichthyomyzon fossor*			X		
Mountain brook lamprey	*Ichthyomyzon greeleyi*			X		
Lake sturgeon	*Acipenser fulvescens*			X		
Shovelnose sturgeon	*Scaphirhynchus platorynchus*			X		
Spotted gar	*Lepisosteus oculatus*			X		
Shortnose gar	*Lepisosteus platostomus*			X		
Cisco (or Lake herring)	*Coregonus artedi*			X		
Goldeye	*Hiodon alosoides*			X		
Shoal chub	*Macrhybopsis hyostoma*			X		
Pugnose minnow	*Opsopoeodus emiliae*			X		
Popeye shiner	*Notropis ariomus*			X		
Longnose sucker	*Catostomus catostomus*			X		
Northern madtom	*Noturus stigmosus*			X		
Scioto madtom	*Noturus trautmani*	X		X		
Pirate perch	*Aphredoderus sayanus*			X		
Western banded killifish	*Fundulus diaphanous menona*			X		
Spotted darter	*Etheostoma maculatum*			X		
Iowa darter	*Etheostoma exile*			X		
Gilt darter	*Percina evides*			X		
Brook trout	*Salvelinus fontinalis*				X	
Bigeye shiner	*Notropis boops*				X	
Tonguetied minnow	*Exoglossum laurae*				X	
Greater redhorse	*Moxostoma valenciennesi*				X	
Channel darter	*Percina copelandi*				X	
American eel	*Anguilla rostrata*				X	
Paddlefish	*Polyodon spathula*				X	
Bigmouth shiner	*Notropis dorsalis*				X	
Lake chubsucker	*Erimyzon sucetta*				X	
River darter	*Percina shumardi*				X	
Tippecanoe darter	*Etheostoma Tippecanoe*				X	
Blue sucker	*Cycleptus elongates*				X	

		FE	FT	SE	ST	SC
Mountain madtom	*Noturus eleutherus*				X	
Lake trout	*Salvelinus namaycush*					X
Lake whitefish	*Coregonus clupeaformis*					X
Burbot	*Lota lota*					X
Muskellunge	*Esox masquinongy*					X
River redhorse	*Moxostoma carinatum*					X
Eastern sand darter	*Ammocrypta pellucida*					X
Least darter	*Etheostoma microperca*					X
Blue catfish	*Ictalurus furcatus*					X
Longnose dace	*Rhinichthys cataractae*					X
AMPHIBIANS						
Eastern hellbender	*Cryptobranchus alleganiensis alleganiensis*			X		
Blue-spotted salamander	*Ambystoma laterale*			X		
Green salamander	*Aneides aeneus*			X		
Cave salamander	*Eurycea lucifuga*			X		
Eastern spadefoot	*Scaphiopus holbrookii*			X		
Mud salamander	*Pseudotriton montanus*				X	
Four-toed salamander	*Hemidactylium scutatum*					X
Eastern cricket frog	*Acris crepitans crepitans*					X
REPTILES						
Copperbelly water snake	*Nerodia erythrogaster neglecta*		X	X		
Plains garter snake	*Thamnophis radix radix*			X		
Timber rattlesnake	*Crotalus horridus horridus*			X		
Eastern massasauga	*Sistrurus catenatus*			X		
Lake Erie water snake	*Nerodia sipedon insularum*				X	
Smooth greensnake	*Opheodrys vernalis*			X		
Kirkland's snake	*Clonophis kirtlandii*				X	
Spotted Turtle	*Clemmys guttata*				X	
Eastern box turtle	*Terrapene carolina*					X
Blanding's turtle	*Emydoidea blandingii*				X	
Ouachita map turtle	*Graptemys ouachitensis*					X
Black king snake	*Lampropeltis getula nigrs*					X
Eastern garter snake (melanistic)	*Thamnophis sirtalis sirtalis*					X
Northern rough green snake	*Opheodrys aestivus*					X
Eastern foxsnake	*Elaphe gloydi*					X
Queensnake	*Regina septemvittata*					X
Little brown skink	*Scincella lateralis*					X
Smooth earthsnake	*Virginia valeriae*					X
Short-headed garter snake	*Thamnophis brachystoma*					X
Eastern hognose snake	*Heterdon platirhinos*					X
BIRDS						
American bittern	*Botaurus lentiginosus*			X		
Northern harrier	*Circus cyaneus*			X		

		FE	FT	SE	ST	SC
King rail	*Rallus elegans*			X		
Sandhill crane	*Grus canadensis*			X		
Piping plover	*Charadrius melodus*	X		X		
Common tern	*Sterna hirundo*			X		
Black tern	*Chlidonias niger*			X		
Loggerhead shrike	*Lanius ludovicianus*			X		
Kirtland's warbler	*Dendroica kirtlandii*			X		
Lark sparrow	*Chondestes grammacus*			X		
Snowy egret	*Egretta thula*			X		
Cattle egret	*Bubulcus ibis*			X		
Upland sandpiper	*Bartramia longicauda*			X		
Black-crowned night-heron	*Nycticorax nycticorax*				X	
Barn Owl	*Tyto alba*				X	
Least bittern	*Ixobrychus exilis*				X	
Peregrine falcon	*Falco peregrines*				X	
Trumpeter Swan	Cygnus buccinators				X	
Sharp-shinned hawk	*Accipiter striatus*					X
Sedge wren	*Cistothorus platensis*					X
Marsh wren	*Cistothorus palustris*					X
Henslow's sparrow	Ammodramus henslowii					X
Cerulean Warbler	*Dendroica cerulean*					X
Prothonotary warbler	*Protonotaria citrea*					X
Black vulture	*Coragyps atratus*					X
Bobolink	*Dolichonyx oryzivorus*					X
Northern bobwhite	*Colinus virginianus*					X
Common moorhen	*Gallinula chloropus*					X
Great egret	*Ardea alba*					X
Sora rail	*Porzana carolina*					X
Virginia rail	*Rallus limicola*					X
Yellow-bellied sapsucker	*Sphyrapicus varius*					X
Red Knot	*Calidris canutus rufa*		X			
MAMMALS						
Indiana bat	*Myotis sodalist*	X		X		
Allegheny woodrat	*Neotoma magister*			X		
Black bear	*ursus americanus*			X		
Pygmy shrew	*Sorex hoyi*					X
Star-nosed mole	*Condylura cristata*					X
Eastern harvest mouse	*Reithrodontomys humulis*				X	
Eastern small-footed bat	*Myotis subulatus*					X
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*					X
Little brown bat	*Myotis lucifugus*					X
Big brown bat	*Eptesicus fuscus*					X
Tri-colored bat	*Perimyotis subflavus*					X
Northern long-eared bat	*Myotis septentrionalis*					X
Woodland jumping mouse	*Napaeozapus insignis*					X
Badger	*Taxidea taxus*					X

		FE	FT	SE	ST	SC
Ermine	*Mustela erminea*					X
Smoky shrew	*Sorex fumerus*					X
Deer Mouse	*Peromyscus maniculatus*					X
Prairie vole	*Microtus ochrogaster*					X
Woodland vole	*Microtus pinetorum*					X
Southern bog lemming	*Synamptomys cooperi*					X
Silver-haired bat	*Lasionycteris noctivagans*					X
Red bat	*Lasiurus borealis*					X
Hoary bat	*Lasiurus cinereus*					X
Snowshoe hare	*Lepus americanus*					X
MOLLUSKS						
Snuffbox	*Epioblasma triquetra*	X		X		
Ebonyshell	*Fusconaia ebena*			X		
Fanshell	*Cyprogenia stegaria*	X		X		
Northern riffleshell	*Epioblasma torulosa rangiana*	X		X		
Butterfly	*Ellipsaria lineolata*			X		
Elephant-ear	*Elliptio crassidens crassidens*			X		
Purple catspaw	*Epioblasma o. obliquata*	X		X		
White catspaw	*Epioblasma obliquata perobliqua*	X		X		
Long-solid	*Fusconaia maculata maculata*			X		
Pink mucket	*Lampsilis orbiculata*	X		X		
Sharp-ridged pocketbook	*Lampsilis ovate*			X		
Yellow sandshell	*Lampsilis teres*			X		
Eastern pondmussel	*Ligumia nasuta*			X		
Washboard	*Megalonaias nervosa*			X		
Sheepnose	*Plethobasus cyphyus*	X		X		
Clubshell	*Pleurobema clava*	X		X		
Ohio pigtoe	*Pleurobema cordatum*			X		
Pyramid pigtoe	*Pleurobema rubrum*			X		
Rabbitsfoot	*Quadrula cylindrical cylindrica*		X	X		
Monkeyface	*Quadrula metanevra*			X		
Wartyback	*Quadrula nodulata*			X		
Purple lilliput	*Toxolasma lividus*			X		
Rayed bean	*Villosa fabalis*	X		X		
Little spectaclecase	*Villosa lienosa*			X		
Black sandshell	*Ligumia recta*				X	
Threehorn wartyback	*Obliquaria reflexa*				X	
Fawnsfoot	*Truncilla donaciformis*				X	
Pondhorn	*Unimerus tetralasmus*				X	
Purple wartyback	*Cyclonaias tuberculata*					X
Wavy-rayed lampmussel	*Lampsilis fasciola*					X
Roung pig-toe	*Pleurobema sintoxia*					X
Salamander mussel	*Simpsonaias ambigua*					X
Deertoe	*Truncilla truncate*					X
Elktoe	*Alasmidonta marginata*					X
Kidneyshell	*Ptychobranchus fasciolaris*					X

		FE	FT	SE	ST	SC
Creek heelsplitter	*Lasmigona compressa*					X
CRAYFISH						
Sloan's crayfish	*Orconectes sloanii*				X	
Cavespring crayfish	*Cambarus tenebrosus*				X	
Great lakes crayfish	*Oroncectes propinquus*					X
Northern crayfish	*Orconectes virilis*					X
Allegheny crayfish	*Orconectes obscures*					X
BEETLES						
Six-banded longhorn beetle	*Dryobius sexnotatus*					X
	Cicindela splendida					X
	Cicindela ancocisconensis					X
	Cicindela cursitans					X
	Cicindela cuprascens					X
	Cicindela macra					X
	Cicindela hirticollis				X	
Cobblestone tiger beetle	*Cicindela marginipennis*				X	
Ohio cave beetle	*Pseudoanophthalmus ohioensis*			X		
American burying beetle	*Nicrophorus americanus*	X		X		
CRICKETS						
Laricis tree cricket	*Oecanthus laricis*					X
ISOPODS						
Fern cave isopod	*Caecidotea filicispeluncae*			X		
Unnamed cave isopod	*Caecidotea sp. nov.*			X		
Frost cave isopod	*Caecidotea rotunda*				X	
DRAGONFLIES						
Hines emerald	*Somatochlora hineana*			X		
Mottled darner	*Aeshna clepsydra*			X		
Plains clubtail	*Gomphus externus*			X		
American emerald	*Cordulia shurtleffi*			X		
Uhler's sundragon	*Helocordulia uhleri*			X		
Frosted whiteface	*Leucorrhinia frigida*			X		
Elfin skimmer	*Nannothemis bell*			X		
Canada darner	*Aeshna canadensis*			X		
Racket-tailed emerald	*Dorocordulia libera*			X		
Brush-tipped emerald	*Somatochlora walshii*			X		
Blue corporal	*Ladona deplanata*			X		
Chalk-fronted corporal	*Ladona julia*			X		
Yellow-sided skimmer	*Libellula flavida*			X		
Riffle snaketail	*Ophiogomphus carolus*				X	
Harlequin darner	*Gomphaeschna furcillata*				X	
Green-faced clubtail	*Gomphus viridifrons*				X	

		FE	FT	SE	ST	SC
Tiger spiketail	*Cordulegaster erronea*					X
DAMSELFLIES						
Lilypad forktail	*Ischnura kellicotti*			X		
Seepage dancer	*Argia bipunctulata*			X		
River jewelwing	*Calopteryx aequabilis*			X		
Boreal bluet	*Enallagma boreale*				X	
Northern bluet	*Enallagma cyathigerum*				X	
Marsh bluet	*Enallagma erbium*				X	
CADDISFLIES						
	Chimarra socia			X		
	Oecetis eddlestoni			X		
	Brachycentrus numerosus			X		
	Psilotreta indecisa				X	
	Hydroptila albicornis				X	
	Hydroptila artesa				X	
	Hydroptila koryaki				X	
	Hydroptila talledaga				X	
	Hydroptila valhalla				X	
	Hydroptila chattanooga					X
	Asynarchus montanus					X
	Nemotaulius hostilis					X
MAYFLIES						
	Rhithrogena pellucida			X		
	Litobrancha recurvata			X		
	Maccaffertium ithica					X
MIDGES						
	Rheopelopia acra			X		
	Bethbilbeckia floridensis				X	
	Apsectrotanypus johnsoni				X	
	Radotanypus florens				X	
	Cantopelopia gesta					X
BUTTERFLIES						
Persius dusky wing	*Erynnis persius*			X		
Frosted elfin	*Incisalia irus*			X		
Karner blue	*Lycaeides melissa samuelis*	X		X		
Purplish copper	*Lycaena helloides*			X		
Swamp metalmark	*Calephelis muticum*			X		
Silver-bordered fritillary	*Boloria selene*				X	
Regal fritillary	*Speyeria idalia*			X		
Mitchell's satyr	*Neonympha mitcdhellii*	X		X		
Grizzled skipper	*Pygus centaureae wyandot*			X		
Two-spotted skipper	*Euphyes bimacula*					X

		FE	FT	SE	ST	SC
Dusted skipper	*Atrytonopsis hianna*					X
MOTHS						
Unexpected cycnia	*Cycnia inopinatus*			X		
Graceful underwing	*Catocala gracilis*			X		
	Spartiniphaga inops			X		
	Hypocoena enervata			X		
	Papaipema silphii			X		
	Papaipema beeriana			X		
	Lithophane semiusta			X		
	Trichoclea artesta			X		
	Tricholita notata			X		
	Melanchra assimilis			X		
Pointed sallow	*Epiglaea apiata*			X		
	Ufeus plicatus			X		
	Ufeus satyricus			X		
Hebard's noctuid	*Erythroecia hebardi*			X		
Wayward nymph	*Catocala antinympha*				X	
	Spartiniphaga panatela				X	
	Fagitana littera				X	
The pink-streak	*Faronta rubripennis*				X	
Milnei's looper moth	*Euchlaena milnei*					X
Buck moth	*Hemileuca maia*					X
One-eyed sphinx	*Smerinthus cerisyi*					X
Precious underwing	*Catocala pretiosa*					X
	Macrochilo bivittata					X
	Phalaenostola hanhami					X
	Paectes abrostolella					X
	Capis curvata					X
	Tarachidia binocula					X
	Apamea mixta					X
	Agroperina lutosa					X
Columbine borer	*Papaipema leucostigma*					X
Bracken borer	*Papaipema pterisii*					X
Osmunda borer	*Papaipema speciosissima*					X
	Chytonix sensilis					X
	Amolita roseola					X
Goat sallow	*Homoglaea hircina*					X
	Brachylomia algens					X
Purple arches	*Polia purpurissata*					X
Scurfy quaker	*Homorthodes f. furfurata*					X
	Trichosilia manifesta					X
	Agonopterix pteleae					X
PSUEDOSCORPIONS						
Buckskin cave psuedoscorpion	*Apochthonius hobbsi*			X		