ENVIRONMENTAL ASSESSMENT

White-tailed Deer Damage Management in Pennsylvania

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ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

In Consultation with

Pennsylvania Game Commission
Pennsylvania Department of Agriculture

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ACRONYMS

AMDUCA	Animal Medical Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSA	Cooperative Service Agreement
CWD	Chronic Wasting Disease
DMAP	Deer Management Assistance Program
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FLIR	Forward Looking Infrared
FY	Fiscal Year
HD	Hemorrhagic Disease
IWDM	Integrated Wildlife Damage Management
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NWRC	National Wildlife Research Center
PADCNR	Pennsylvania Department of Conservation and Natural Resources
PDA	Pennsylvania Department of Agriculture
PDH	Pennsylvania Department of Health
PGC	Pennsylvania Game Commission
SOP	Standard Operating Procedures
T&E	Threatened and Endangered
TA	Technical Assistance
TB	Tuberculosis
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WAC	Wildlife Acceptance Capacity
WDDM	White-tailed Deer Damage Management
WDM	Wildlife 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 Pennsylvania. This Environmental Assessment (EA) documents the analysis of the potential environmental effects of a proposed Pennsylvania WS integrated white-tailed deer damage management (WDDM) program to alleviate damage to agriculture, property, natural resources, 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 Pennsylvania 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 1992). 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 Pennsylvania 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.

White-tailed deer (hereto referred to simply as "deer") in Pennsylvania are managed by the Pennsylvania Game Commission (PGC). Pennsylvania's Game and Wildlife Code directs the Game Commission to protect, manage, and preserve wildlife and its habitat within the Commonwealth (Title 34, Sections 322 and 2102). The Pennsylvania Game Commission legally is mandated to manage wildlife, including deer, for the benefit of all Pennsylvanians, as well as for wildlife and the habitats that support their existence. Based on direction from the state Constitution and Game and Wildlife Code, the Game Commission adopted the mission statement "*to manage all wild birds, wild mammals, and their habitats for current and future generations.*" Additionally, the Code guides the agency to use hunting and trapping to manage wildlife populations and to preserve and promote our special heritage of hunting and furtaking by

[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.

providing adequate opportunity to hunt and trap the wildlife resources of this Commonwealth (Title 34, Sections 103 and 322).

The PGC follows an adaptive management approach to deer management. Adaptive management starts by establishing clear and measurable objectives, then implementing management actions, monitoring those management actions and whether they achieved the objectives, and adapting policy and management actions as necessary. The focus of adaptive management is on monitoring responses to management actions and learning. By managing white-tailed deer in this way, the PGC can effectively adapt its management program as conditions change. The PGC deer management goals from 2009 to 2018 are to (1) manage deer for a healthy and sustainable deer herd, (2) manage deer-human conflicts at levels considered safe and acceptable to Pennsylvania citizens, (3) manage deer impacts for healthy and sustainable forest habitat, (4) manage deer to provides recreational opportunities, and (5) improve the public's knowledge and understanding of deer and the deer management program (PGC 2011). PGC staff uses these guidelines when making recommendations regarding deer management in Pennsylvania.

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 2003). With the expansion of human populations into rural environments, and the historic decline of natural deer predators (e.g., gray 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 overabundant 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, but the 2011 statistics show a 7% decrease in the total over the previous year and a 9% decrease over the previous three years (Williams et al. 2012). Williams et al. (2012) estimated that there were more than 200 human deaths attributable to deer-vehicle collisions annually. Damage costs associated with deer-vehicle collisions in 2014 were estimated at $3,888 per incident, which was an increase of 13.9% over the 2013 estimate (State Farm Mutual Automobile Insurance Company 2014). 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 Pennsylvania, there were 3,364 reportable deer-vehicle collisions in 2013; a 15% increase from the 2,923 deer-vehicle collisions reported in 2009 (PENNDOT 2009 and 2013). Reportable collisions are collisions where the vehicle required towing or injuries were reported. Given that the majority of deer vehicle collisions in the state do not result in extensive vehicle damage or injuries, these numbers are only a fraction of the total number of deer vehicle collisions occurring in the state. PENNDOT estimates that, on average, approximately 28,000 deer are removed each year from PENNDOT right-of-ways (Mallin, D. PENNDOT, Pers. Comm. 2015). This estimate does not include deer that either survived the collision or died off of PENNDOT right-of-ways. State Farm Mutual Automobile Insurance Company estimates

123,941 claims will be filed in Pennsylvania for deer vehicle collisions during 2013-2014, or about 10% of all claims in the United States (State Farm Mutual Automobile Insurance Company 2014). State Farm estimates that the 2013-2014 likelihood of drivers in Pennsylvania having a collision with deer is 1 in 71. Between 2009 and 2013, there were 41 fatalities reported from deer-vehicle collisions, with the highest number being 11 in 2013 (PENNDOT 2009, 2010, 2011, 2012, 2013).

1.2.2 Deer Damage at Airfields

White-tailed deer populations have increased in the U.S. from approximately 350,000 in 1900 to over 28 million in 2010 (VerCauteren et al. 2011), and the expanding population may bring more deer into the vicinity of airfields. Deer were involved in 34% of the reported mammal-aircraft strikes and in 88% of the damaging strikes involving terrestrial mammals from 1990 through 2013 (Dolbeer et al. 2014). Of the 379 reported instances of human injury due to wildlife-aircraft strikes in the Federal Aviation Administration (FAA) database, deer were involved in 20 of the strikes, causing 29 injuries. In Pennsylvania, from 1990 through 2013 a total of 4,880 wildlife strikes to aircraft were reported to the FAA with 69 of these strikes involving white-tailed deer (FAA 2014).

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 and landing, can cause the aircraft to crash or sustain physical damage (FAA 1997). Mammals, especially deer, 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, freeze when caught in beams of light, resulting in a strike. The majority of deer strikes occur at night and in the fall during the breeding season (Dolbeer et al. 1995).

Deer commonly pose a threat to aviation safety at airfields in Pennsylvania. Pennsylvania has a total of 135 public airports (PENNDOT 2015). Airports provide ideal conditions for deer and other wildlife due to the large grassy areas adjacent to brushy, forested habitat. Airport habitats provide deer excellent feeding and bedding sites and are usually protected from hunting and other human disturbance. Collisions between deer and aircraft have caused millions of dollars of damage over the past decade and can threaten public safety (FAA 2001). Serious consequences are also possible if pilots lose control of the aircraft while attempting to avert a collision with deer. In January 2001, an aircraft owned by a professional team organizer struck a deer while landing at the Troy, Alabama airport. The pilot and passengers were injured and the aircraft was destroyed (Blackley 2001). More recently, a U.S. Customs jet was destroyed on landing at a South Carolina airport after striking a deer. All crew members escaped unharmed, but the jet was a total loss (Dolbeer et al. 2013).

Wildlife collisions with aircraft are a serious economic and safety problem (Dolbeer et al. 2013). Dolbeer et al. (2014) estimated that between 1990 and 2013 wildlife strikes cost the U.S. civil aviation industry a minimum of 117,740 hours/year of aircraft down time and $187 million/year in direct and other monetary losses. The maximum annual cost of wildlife strikes to the USA civil aviation industry is estimated to be 588,699 hours of aircraft downtime and $937 million in direct and other monetary losses. In a recent study which ranked the hazard to aviation for wildlife species commonly involved in aircraft strikes, deer were ranked as the most hazardous species group (DeVault et al. 2011). This study found that 87% of reported deer-aircraft collisions resulted in damage. While there does not have to be contact between aircraft and wildlife for a strike report to be filed (near-misses are counted as strikes), 68% of deer-aircraft strike reports noted a negative effect on the flight (aborted take-off, engine shutdown, etc.) (DeVault et al. 2011).

Annual reporting of wildlife strikes has increased markedly over the years, and it is now estimated that 39% of all wildlife strikes at certificated airports are reported, leaving 61% of strikes unreported (Dolbeer et al. 2013). Additionally, many reports received by the FAA are filed before aircraft damage had been fully assessed. For these reasons, the information on the number of strikes and their associated costs compiled from the voluntary reporting program is believed to under represent the magnitude of the risk and problem (Cleary et al. 1997).

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). 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, $717,350 in damage to landscaping from deer browsing in Pennsylvania was reported to WS. This number is 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). 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, De Calesta (1994a) 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 (De Calesta 1994b). 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/mi^2 and another two disappeared at 63.7 deer/mi^2. 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). Deer populations have been managed for many years to protect natural resources including threatened and endangered species found in forest preserves around Chicago (Engeman et al. 2014). High deer densities in Chicago forest preserves were found to cause significant damage to native flora. After a series of annual deer removals, mean percent ground cover, mean plant height, and number of plant indicator species had a considerable positive response (Etter et al. 2000). This response was the result of cumulative deer harvests and a subsequent decline in deer populations. Over-abundant deer populations were identified as one of the greatest threats to plant communities in the Chicago area (Engeman et al 2014). Deer were identified as a "native invasive species" with the following reasoning:

> *"Included among the three circumstances where native species function as invaders, according to Carey et al. (2012), are when "human-mediated environmental change facilitates population growth of native species via elevated survivorship and reproduction" and when "habitat modifications or other changes in the environment may increase the per capita effect of native species on the resident community." Both of these circumstances directly apply to white-tailed deer in urbanized settings. Populations thrive and reproduce in the absence of large predators (including hunting), while natural habitats are restricted by urbanization to reserves and open spaces, placing greater pressure on the plant communities within them, especially rare species. Negative interactions with humans also increase in urbanized settings holding high numbers of deer"* (Engeman et al. 2014).

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. However, CWD has been detected in captive deer herds in two counties and in free-ranging deer in two counties in the Commonwealth (PGC 2014).

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. In experimentally infected captive deer, the time from exposure to onset of clinical signs of the disease was about 15 months and the average time to death was 23 months, and CWD is always fatal (PGC 2009).

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 2002b, Miller et al. 2004). Since monitoring began in Pennsylvania in 1998, approximately 52,000 samples have been tested, with a total of 10 positives (Brown, J. PGC, Pers. Comm. 2015). Samples are collected from hunter harvested and road kill deer, and upon receipt of calls for sick deer.

On three separate occasions between 2013 and 2015 WS has assisted with removing deer from captive facilities. Due to transmission methods, deer contained within fenced properties could pose a risk to wild populations, be at risk from positive wild deer, or pose a risk to other captive deer at the facility. Captive deer are managed by the Pennsylvania Department of Agriculture and management of deer within captive situations would be at their direction. In these cases all or a portion of the captive deer would be removed to prevent disease transmission. WS may also be asked to assist with removal of escaped cervids. In these cases the animals CWD status is unknown but could pose a significant disease threat to wild populations and removal from the landscape is critical. The jurisdiction of these animals is often complicated but coordination with PDA and PGC is conducted. With approximately 1,139 captive cervid facilities in Pennsylvania (Romano 2012) the threat of CWD occurrence in captive deer and potential transmission to wild populations is high. It is possible that a captive deer herd could become infected, and that WS could be asked to assist regulatory authorities to depopulate the herd. Depopulation efforts are more intense than those used to manage a wild population, in that it requires all individuals in a population be removed.

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). Indirect transmission could occur at contaminated hay bales, feed troughs, and bait/feed piles. 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.

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 previous USDA rules governing state bovine TB status, at the end of 2013, 48 states were in "Accredited Free" status and two states were in "Modified Accredited" status (USDA Veterinary Services 2013). Under the new USDA rules governing state bovine TB status, Pennsylvania's status maintained its "Accredited Free" status (USDA Veterinary Services 2013). 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 quite some time, it appears that the risk of tuberculosis in humans from this situation is low.

Tick Borne Diseases. The Pennsylvania Department of Public Health (PDH) documents and tracks human reported cases of Lyme disease (*Borrelia burgdorferi*). Research has shown a direct correlation between infected ticks, deer numbers, and Lyme disease cases (Deblinger et al. 1993, Magnarelli et al. 1984). Deer are an important reservoir for Lyme disease and are the primary host for adult deer ticks (Conover 1997). Lyme disease incidence has also been linked to landscape features such as urban developed areas versus wooded residential areas (Montgomery County Pennsylvania Health Department 2000). There are a number of other tick borne diseases that may affect humans including Anaplasmosis (*Anaplasma phagocytophilum*), Ehrlichiosis (*E. chaffeensis* and *E. ewingii*), Babesiosis (*Babesia microti*), and Rocky Mountain spotted fever (*Rickettsia rickettsii*). The blacklegged tick (*Ixodes scapularis*), commonly known as a "deer tick" is a common carrier of these diseases as is the American dog tick (*Dermacentor variabilis*), and lone star tick (*Amblyomma americanum*). Deer are the primary host of the blacklegged tick and occasional host of other tick species (CDC 2014, Stafford and Williams 2014). The blacklegged tick is also the primary vector for Lyme disease, and although deer do not appear to be competent reservoir for Lyme disease they do provide significant blood meals for the diseases primary host which aid in reproduction potential (Rand et al. 2003, Stafford and William 2014) as well as occasional host for other tick species possibly inflating tick densities. Numerous studies have shown that the reduction in deer density can help reduce tick densities in the environment (Wilson et al. 1984, Rand et al. 2003, Stafford and William 2014) and/or Lyme disease occurrence in humans (Kilpatrick et al. 2014, Stafford and William 2014).

1.2.5 Deer Damage to Agriculture

Conover (1997) estimates that deer cause $100 million in damage to agricultural productivity annually. Deer are most often cited as being the source of the wildlife damage (Conover and Decker 1991); 67% of all farmers reported problems with deer (Conover 1994). To assist landowners in achieving their deer management goals, the PGC developed a number of landowner assistance programs. The Agricultural Deer Control Permit Program (Red Tag Program), established in 1995, and the Deer Management Assistance Program (DMAP), established in 2003, provide landowners with additional permits for hunters to take antlerless deer. The PGC does not track the value of damage to agriculture in the state, but does track the number of deer removal permits issued each year to individuals attempting to reduce damage (Tables 1 and 2). For fiscal year (FY) 09 through FY14, $1,742,220 in damage to agriculture from deer in Pennsylvania was reported to WS.

Table 1. Number of Acres, Coupons Approved, Coupons Redeemed, Hunter Success, and Reporting Rate by Year in Pennsylvania's Deer Management Assistance Program (DMAP).

Year	Acres Enrolled	Coupons Approved	Coupons Redeemed	Antlerless Harvest	Reporting Rate (%)

2003-04	696,309	31,898	23,348	6,250	99
2004-05	1,722,619	47,848	34,135	7,946	81
2005-06	1,945,759	42,279	31,641	7,644	84
2006-07	1,877,850	36,841	28,432	7,396	78
2007-08	1,470,306	32,379	22,148	5,006	79
2008-09	1,502,896	30,476	23,520	5,744	78
2009-10	1,650,783	33,642	26,877	4,305	54
2010-11	1,658,732	27,588	23,736	4,423	54
2011-12	1,448,521	27,519	23,915	3,933	52
2012-13	1,479,477	28,170	24,644	3,852	47
2013-14	1,733,899	30,276	26,962	4,583	46

Table 2. Red Tag Participants and Harvest in Pennsylvania 2005-2013.

Year	Participants enrolled	Harvest
2005	168	867
2006	197	1,013
2007	223	982
2008	169	1.002
2009	189	1,261
2010	165	964
2011	160	1,160
2012	208	1,159
2013	182	1,120

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 Pennsylvania 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)?

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.3.1 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 Pennsylvania.

1.3.2 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 Pennsylvania 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.

1.3.3 Site Specificity

This EA analyzes and addresses the potential impacts of WS WDDM activities on all private and public lands in Pennsylvania 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 Pennsylvania. 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 Pennsylvania (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 Pennsylvania. 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.

1.3.4 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 *The Patriot-News* 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).

1.4 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

USDA 2003 Environmental Assessment: White-tailed Deer Damage Management in Pennsylvania.

WS has previously developed an EA that analyzed the need for action to manage damage associated with deer (USDA 2003). An EA Supplement to the 2003 EA was completed in 2012. 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.

USDA 2000 Environmental Assessment: Shooting White-tailed Deer to Assist the City of Philadelphia, Fairmount Park Commission in Achieving Deer Population Reductions on Park Properties Located in the Pennsylvania Counties of Delaware, Montgomery and Philadelphia.

WS has previously developed an EA that analyzed the need for action to manage damage associated with deer in the Pennsylvania Counties of Delaware, Montgomery and Philadelphia (USDA 2000). 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.

1.5 AUTHORITY AND COMPLIANCE

1.5.1 Wildlife Services Legislative Authority

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

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

1.6.2 U.S. Department of Interior, Fish and Wildlife Service Legislative Authority

The U.S. Fish and Wildlife Service (USFWS) is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife resources and their habitats. The USFWS mission is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Responsibilities are shared with other federal, state, tribal, and local entities; however, the USFWS has specific responsibilities for threatened and endangered (T&E) species protection under the ESA, migratory birds, inter-jurisdictional fish, and certain marine mammals, as well as for lands and waters that the USFWS administers for the management and protection of those resources.

1.5.3 Pennsylvania Game Commission Legislative Authority

Pennsylvania's Game and Wildlife Code directs the Game Commission to protect, manage, and preserve wildlife and its habitat within the Commonwealth (Title 34, Sections 322 and 2102). The Pennsylvania Game Commission legally is mandated to manage wildlife, including deer, for the benefit of all Pennsylvanians, as well as for wildlife and the habitats that support their existence. Based on direction from the state Constitution and Game and Wildlife Code, the Game Commission adopted the mission statement "to manage all wild birds, wild mammals, and their habitats for current and future generations." Additionally, the Code guides the agency to use hunting and trapping to manage wildlife populations and to preserve and promote our special heritage of hunting and furtaking by providing adequate opportunity to hunt and trap the wildlife resources of this Commonwealth (Title 34, Sections 103 and 322).

1.5.4 Pennsylvania Department of Agriculture

The PDA's mission, under the Pennsylvania State Code Title 3, is to encourage, protect, and promote agriculture and related industries throughout the Commonwealth while providing consumer protection through inspection services that impact the health and financial security of Pennsylvania's citizens. This is conducted under the direction of the Governor appointed Secretary of Agriculture and guidance from 14 boards and 15 committees/commissions comprised of members of PDA, the legislature, industry, educational institutions, other state agencies, and the general public. PDA administers many laws. Many of them are found in Pennsylvania State Code Title 3 with detailed information available by contacting the PDA bureau tasked with management of the related topic.

1.5.5 Pennsylvania Fish and Boat Commission

The PAFBC is an independent Commonwealth agency comprised of 10 commissioners appointed by the Governor and approved by the Legislature. Day to day operations are overseen by an Executive Director. The Executive Director is the PAFBC's chief executive officer as well as chief waterways conservation officer, and has charge of all activities under the jurisdiction of the Commission. PAFBC administers many laws as listed in the Pennsylvania State Code Title 30.

1.5.6 Pennsylvania Department of Conservation and Natural Resources

The PADCNR is charged with maintaining and preserving the 120 state parks; managing the 2.2 million acres of state forest land; providing information on the state's ecological and geologic resources; and establishing community conservation partnerships with grants and technical assistance to benefit rivers, trails, greenways, local parks and recreation, regional heritage parks, open space and natural areas. The PADCNR administers many laws as listed in the Pennsylvania State Code Title 27 and 32.

1.5.7 Pennsylvania Department of Health

The PDH was created by the Act of April 27, 1905, P.L. 312, and modified subsequently through the Administrative Code of 1929. The PDH mission is to promote healthy lifestyles, prevent injury and disease, and to assure the safe delivery of quality health care for all Commonwealth citizens. PDH works collaboratively with public and private partners in Pennsylvania communities to facilitate the development of an effective public health system that promotes the optimal health of its citizens while reducing the need for health care.

1.5.8 Compliance with Other Federal and State Statutes

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 (NEPA). 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, CFR, 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. If it is determined that the action may result in significant impacts, an EIS may be prepared.

Endangered Species Act (ESA). It is federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act (Sec. 2(c)). WS conducts Section 7 consultations, as necessary, with other federal agencies to use their expertise 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)).

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 will consult with the Pennsylvania Coastal Management Program regarding consistency of the proposed program with the State Coastal Zone Management Plan in accordance with the provisions of the Act.

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

level. WS consults with appropriate regulatory authorities when wetlands exist in proximity to proposed activities or when such activities might impact wetland areas. Such consultations are designed to determine if any wetlands will be affected by proposed actions.

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

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

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

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

Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations (Environmental Justice and Executive Order 12898). Executive Order 12898 promotes the fair treatment of people of all races, income levels, and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. 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. WS 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 deer 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 WDDM 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 and military airbases 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 Pennsylvania, the PGC 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 only), 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:

1. Effects on white-tailed deer populations, regulated deer hunting, and aesthetics;
2. Effects on non-target and other wildlife species, including threatened and endangered species;
3. 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. In Pennsylvania, where deer pose damage problems in various habitats and where populations of damaging species have exceeded acceptable levels, the PGC 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 PGC 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 PGC 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).

Pennsylvania 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. Pennsylvania Natural Heritage Program (PNHP) has provided a list of both state listed T&E species that occur in Pennsylvania (Appendix C). A current list of federal listed species can be found online (USFWS 2014).

The Endangered Species Act (ESA) states that all federal agencies *"...shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act"* [Sec. 7(a)(1)]. WS conducts Section 7 consultations under the ESA with the U.S. Fish and Wildlife Service (USFWS) to ensure compliance and 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)].

To reduce the risks of adverse effects to non-target species, including T&E species, WS would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of negatively affecting non-target species.

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 T&E 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 are also tested annually before they are allowed to remove deer under Deer Population Control Permits issued by the PGC. 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 Pennsylvania 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 Pennsylvania 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 Pennsylvania 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 Pennsylvania would continue to conduct WDDM in a very small area of 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 spread 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. The meat from deer lethally removed would be disposed of as directed by the PGC in the Deer Control Permit. 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 mammals by WS using firearms in Pennsylvania 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 (e.g., at an airport). 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

Pennsylvania 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 take 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 her or his responsibility to ensure that recommended methods and agents of euthanasia are preferentially used."

Pennsylvania 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 Wildlife Damage Management (WDM) 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 U.S. Wildlife damage management is an appropriate sphere of activity for government programs, because aspects of wildlife damage management are a government responsibility and authorized by law. In Pennsylvania, 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 Pennsylvania. 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 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 Pennsylvania, 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's *"White-tailed Deer Damage Management in Pennsylvania"* and *"Shooting White-tailed Deer to Assist the City of Philadelphia, Fairmount Park Commission in Achieving Deer Population Reductions on Park Properties Located in the Pennsylvania Counties of Delaware, Montgomery and Philadelphia."* 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 Pennsylvania. An IWDM approach would be implemented on all private and public lands of Pennsylvania 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 2, 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 PGC. 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 appropriate 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 the PGC, 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 the PGC, 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 PGC.

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.

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

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

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.

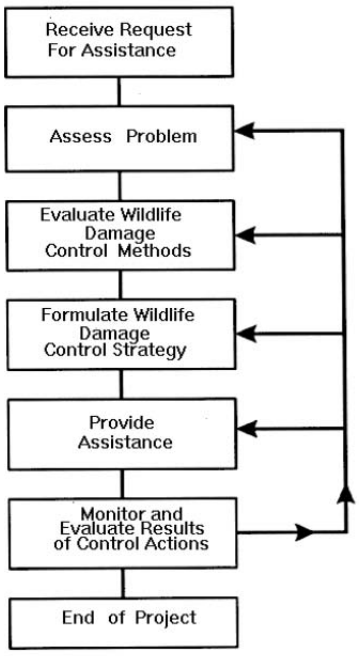

Figure 1. WS Decision Model, as presented by Stale et al. (1992), for developing a strategy to respond to a request for assistance with human-wildlife conflicts.

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 3). 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, 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 assessing the problem 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 Pennsylvania 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 Pennsylvania 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. As a result of the disease risk, stress and mortality risks, and lack of need for population restoration, the PGC does not permit the use of trap and transfer as a deer management option (PGC 2009). Therefore, since PGC will not authorize the action, WS will not consider it further.

3.4.2 Use of Immunocontraceptives

Since the completion of the 2000 and 2003 EA's, an immunocontraceptive for deer has been developed and federally registered under the trade name GonaCon™. GonaCon™ is an immunocontraceptive vaccine registered for use in female white-tailed deer at least one year of age or older that targets the production of the GnRH hormone. While some members of the public believe fertility control to be more humane and morally acceptable than lethal management techniques, they do not take into account the efficiency, practicality, or safety of these drugs (PGC 2009). By the time communities initiate action to manage local deer populations, conflicts are typically at crisis level. The PGC states that "current fertility control agents are not timely deer management tools" (PGC 2009). "From a wildlife conflict resolution viewpoint, if you can't stabilize or reduce a deer population with a contraceptive—no matter how well it works on treated individuals—you don't have a management tool" (Rutberg 2005). The PGC states that "Although the Game Commission understands the desire by some to use fertility control agents as an alternative to lethal methods, fertility control agents have not demonstrated an ability to reduce deer-human conflicts" (PGC 2009). Given the stance of the PGC on the use of immunocontraceptives, WS will not consider the use of 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 (Johnson et al. 2001).
- WS' employees that use controlled substances are trained to use each material and are certified to use controlled substances under state certification programs.
- 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 WDM 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' take is monitored by comparing numbers of deer killed with overall populations or trends in populations to assure the magnitude of take 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 Pennsylvania. While annual take will likely be much lower, Pennsylvania WS expects that no more than 3,000 deer would be lethally removed annually under permits issued by the PGC while conducting WS direct damage management activities. Therefore, a maximum take of 3,000 deer was used to analyze WS potential impacts to the statewide deer population in Pennsylvania.

White-tailed Deer Population Analysis

According to the PGC, white-tailed deer are found in every county in Pennsylvania. Their highest densities are associated with wooded areas near watersheds along major rivers, though urban and suburban areas may have very high densities as well. Deer breed in Pennsylvania as early as September and can last into February. Most adult does are bred in November, with fawn breeding extending through December into February. Mature does with good nutrition will often have twins or triplets, while quadruplets are rare but possible.

The PGC is responsible for the management of resident, protected wildlife species in Pennsylvania, and deer are classified as game mammals. The PGC 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 308,920 to 352,920 deer with an average of 332,207 deer harvested per year.

The number of deer taken by WS, taken by non-WS personnel under permits issued by the PGC, and harvested by hunters in Pennsylvania is illustrated in Table 3. The maximum number of deer removed by WS in any year was 1,216 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. Thus, cumulative take will have had a negligible impact on the statewide deer population as WS' take is not expected to exceed 1% of the other forms of regulated harvest (Rosenberry, C. PGC, Pers. Comm. 2015).

Table 3. Deer Harvest Data for Hunters, Nuisance Permits, and WS' Take in Pennsylvania from 2009-2014.

PGC Season Harvest Entity	2009	2010	2011	2012	2013	2014
# Taken During State Regulated Harvest Season[1]	335,850	308,920	316,240	336,200	343,110	352,920
# Taken Under PGC Nuisance Permits[1,2]	6,746	5,566	5,387	5,093	7,167	NA
WS Take in Pennsylvania[3,4]	819	1,135	748	983	1,144	1,274
Total Harvest[5]	342,596	314,486	321,627	341,293	350,277	>354,194
WS Take as % of Total Harvest	0.24%	0.36%	0.23%	0.29%	0.33%	< 0.36%
WS Proposed Take (3,000) as % of Total Harvest	0.88%	0.95%	0.93%	0.88%	0.86%	< 0.85%

[1] Harvest by sport hunters and take under nuisance permits reported by the PGC are by Commonwealth fiscal year, July 1 through June 30

[2]Number of deer taken under PGC nuisance permits includes WS' take.

[3] WS' take is reported by the calendar year

[4] WS' total deer take in the Commonwealth

[5] Total harvest for 2014 does not include all deer taken under PGC nuisance permits as data was not available

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 PGC.

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). Similarly, as in the past, 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 the PDA and/or the appropriate management authority under appropriate authorizations. Complete removal of a captive deer herd would not impact the statewide population of wild, free-ranging deer as captive herds are typically isolated.

Effects on Aesthetic Values

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

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 to those actions. 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 reduced on a case-by-case basis 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 PGC to remove deer that are causing damage. This activity would result in reduced deer densities on and adjacent to project areas and may reduce densities in some small portions of some wildlife

management units, 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 taken by WS is minimal (< 1.0%) when compared to the number taken by hunters across the state.
- The number of deer expected to be taken 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. Pennsylvania WS has taken no non-target species while conducting WDDM during the review period (FY09-FY13). 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 Pennsylvania (USFWS 2014) and has determined that the Proposed Action will have no effect on federal T&E species or their critical habitat in Pennsylvania. The methods used and locations of WDDM do not directly interfere with the viability of any listed species in Pennsylvania. 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 that the 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 PDA. 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 PDA and PGC.

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 take 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 PGC 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 the PGC. 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 lethal 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 under this alternative, regardless of the impacts on the deer population. The effectiveness of this alternative without a full range of IWDM tools 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 the PGC 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 recommend 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 PGC 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 the PGC. 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 under this alternative. However, resource owners may still remove deer under the same permits issued by the PGC, 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 Pennsylvania; 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 1. 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 Pennsylvania, 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 Pennsylvania. 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 Pennsylvania and its impact on the deer population is a concern to some hunters in Pennsylvania. Pennsylvania has recently had three outbreaks of hemorrhagic disease in white-tailed deer in 1996 (not confirmed), 2002, and 2007. One positive case was diagnosed in Northampton County in August of 2011 (PGC 2013). 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 PGC, the effects of disease outbreak and damage management needs will likely be considered by the PGC 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:

1. 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.

2. 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).

3. 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 Pennsylvania. As a result, no cumulative adverse effects are expected from repetitive WDDM programs over time in the fairly static set of conditions currently affecting deer or other wildlife in Pennsylvania.

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.

WS does not use lead ammunition in areas where it is prohibited by law or where prohibited by the landowner/manager (e.g., National Park Service). WS uses lead-free rifle ammunition in deer culling activities, except in certain situations where concerns regarding ammunition performance and safety are limiting factors (e.g., shooting from greater distances or situations such as suburban and airport projects where risk of ricochet/pass through is a particular concern). When allowed by regulations and landowners, WS may give preference to lead shot for aerial hunting in rocky terrain where aerial hunting is involved. APHIS-WS adheres to all applicable laws governing the use of lead ammunition in APHIS-WS activities and landowner/manager desires for lead-free ammunition in their projects.

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 PGC 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 in situations that ensure accuracy and that misses occur infrequently which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement ensures carcasses would be retrieved and disposed of properly to limit the availability of lead in the environment 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 Pennsylvania, 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 Pennsylvania, 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 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 A: LITERATURE CITED

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APPENDIX B: WHITE-TAILED DEER DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE PENNSYLVANIA 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. 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.

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 other audio/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, and dogs 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). Misuse of this tool can lead to habituation of the deer to the sound.

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 or in the beds of vehicles. 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, in accordance with state regulations, to attract deer to safe sites for shooting and to enhance success and efficiency.

The venison from deer killed by WS could be processed and donated for consumption to one or more charitable organizations as directed by the PGC. WS, or their cooperators, will be responsible for properly preparing deer and delivery to a 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 Pennsylvania 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 independently 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 captured using tranquilizing drugs and/or chemically euthanized would be unsuitable for human consumption. Deer chemically euthanized would be disposed of by incineration.

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.

SPORT HUNTING: White-tailed deer hunting is a robust industry in Pennsylvania. The statewide archery season opens in early October and runs into mid-November, reopening in late December through mid-January. As of the 2014 season, Wildlife Management Units (WMUs) 2B, 5C, and 5D have extended antlerless-only archery seasons in late September and late November and have an extended antlered and antlerless season in late January. There is an antlerless-only muzzle-loading rifle season in mid-October and a flintlock rifle only season from late December through mid-January with an extension in WMUs 2B, 5C, and 5D through late January. There is a three day statewide antlerless-only season for junior and senior license holders, disabled person permit holders, and Pennsylvania residents serving on active duty in the U.S. Armed Services or in the U.S. Coast Guard. Regular firearms season typically opens in late November and runs through mid-December. Allegheny, Bucks, Chester, Delaware, Montgomery and Philadelphia counties have an extended regular firearms season from late December through late January. See http://www.portal.state.pa.us/portal/server.pt/community/deer/11949 for more information on deer hunting opportunities in Pennsylvania.

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

[1]List obtained from <http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=PA&s8fid=112761032792&s8fid=112762573902> on 29 March 2013

Notes:

- This report shows the listed species associated in some way with this state.
- This list does not include experimental populations and similarity of appearance listings.
- This list includes non-nesting sea turtles and whales in State/Territory coastal waters.
- This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.

Summary of Animals listings:

Animal species listed in this state that occur in this state (10 species):

Status	Species
E	Bat, Indiana Entire (*Myotis sodalis*)
E	Bean, rayed (*Villosa fabalis*)
E	Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
E	Mussel, sheepnose (*Plethobasus cyphyus*)
E	Mussel, snuffbox (*Epioblasma triquetra*)
E	Plover, piping Great Lakes watershed (*Charadrius melodus*)
E	Riffleshell, northern Entire (*Epioblasma torulosa rangiana*)
E	Sturgeon, shortnose Entire (*Acipenser brevirostrum*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf Entire (*Alasmidonta heterodon*)

Animal species listed in this state that do not occur in this state (11 species):

Status	Species
E	Beetle, American burying Entire (*Nicrophorus americanus*)
E	Butterfly, Karner blue Entire (*Lycaeides melissa samuelis*)
E	Fanshell (*Cyprogenia stegaria*)
E	Mucket, pink (pearlymussel) Entire (*Lampsilis abrupta*)
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
E	Puma (=cougar), eastern Entire (*Puma (=Felis) concolor couguar*)
E	Ring pink (mussel) (*Obovaria retusa*)
E	Squirrel, Delmarva Peninsula fox Entire, except Sussex Co., DE (*Sciurus niger cinereus*)
T	Tiger beetle, northeastern beach Entire (*Cicindela dorsalis dorsalis*)
E	Wolf, gray U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, KS, KY, LA, MA, MD, ME, MO, MS, NC, NE, NH, NJ, NV, NY, OK, PA, RI, SC, TN, VA, VT and WV; those portions of AZ, NM, and TX not included in an experimental population; and portions of IA, IN, IL, ND, OH, OR, SD, UT, and WA. Mexico. (*Canis lupus*)

APPENDIX D: SPECIES LISTED BY THE COMMONWEALTH OF PENNSLYVANIA[1]

[1]List obtained from <http://www.naturalheritage.state.pa.us/HomePage.aspx> on 29 March 2013

Scientific Name	Common Name	State Status[2]
Abies balsamea	Balsam Fir	N
Acalypha deamii	Three-seeded Mercury	N
Ageratina aromatica	Small White-snakeroot	N
Alopecurus aequalis	Short-awn Foxtail	N
Amelanchier canadensis	Serviceberry	N
Andropogon gyrans	Elliott's Beardgrass	N
Antennaria virginica	Shale Barren Pussytoes	N
Arabis patens	Spreading Rockcress	N
Arctosa littoralis	A Sand Spider	N
Aristida longespica	Three-awned grass	N
Aristida longespica var. longespica	Slender Three-awn	N
Arnoglossum reniforme	Great Indian-plantain	N
Asimina triloba	Pawpaw	N
Asplenium pinnatifidum	Lobed Spleenwort	N
Astragalus canadensis	Canadian Milkvetch	N
Baptisia australis	Blue False-indigo	N
Bartonia paniculata	Screw-stem	N
Bidens discoidea	Small Beggar-ticks	N
Bidens laevis	Beggar-ticks	N
Botrychium simplex	Least Grape-fern	N
Bromus kalmii	Brome Grass	N
Calamagrostis porteri	Porter's Reedgrass	N
Cardamine maxima	Large Toothwort	N
Carex brevior	A Sedge	N
Carex ormostachya	Spike Sedge	N
Carex planispicata	Flat-spiked sedge	N
Carex richardsonii	Richardson's Sedge	N
Carex shortiana	Sedge	N
Carex siccata	A Sedge	N
Carex sprengelii	Sedge	N
Carya laciniosa	Shellbark Hickory	N
Chionanthus virginicus	Fringe-tree	N
Conoclinium coelestinum	Mistflower	N
Corydalis aurea	Golden Corydalis	N
Crataegus dilatata	A Hawthorn	N
Crataegus pennsylvanica	Red-fruited Hawthorn	N
Cuscuta campestris	Dodder	N
Cuscuta compacta	Dodder	N
Cuscuta pentagona	Field Dodder	N
Cyperus lancastriensis	Many-flowered Umbrella Sedge	N
Cystopteris tennesseensis	Bladder Fern	N
Deschampsia cespitosa	Tufted Hairgrass	N
Desmodium laevigatum	Smooth Tick-trefoil	N
Desmodium obtusum	Stiff Tick-trefoil	N
Desmodium viridiflorum	Velvety Tick-trefoil	N

Diarrhena americana	American Beakgrain	N
Dichanthelium laxiflorum	Lax-flower Witchgrass	N
Dichanthelium oligosanthes	Heller's Witchgrass	N
Dryopteris celsa	Log Fern	N
Dryopteris clintoniana	Clinton's Wood Fern	N
Dryopteris filix-mas	Male Fern	N
Elymus trachycaulus	Slender Wheatgrass	N
Equisetum x ferrissii	Scouring-rush	N
Erythronium albidum	White Trout-lily	N
Eupatorium godfreyanum	Godfrey's Thoroughwort	N
Eurybia radula	Rough-leaved Aster	N
Fraxinus profunda	Pumpkin Ash	N
Fraxinus quadrangulata	Blue Ash	N
Galium latifolium	Purple Bedstraw	N
Galium trifidum	Marsh Bedstraw	N
Gentiana linearis	Narrow-leaved Gentian	N
Goodyera repens	Lesser Rattlesnake-plantain	N
Gymnocarpium x heterosporum	A Fern Hybrid (Sterile Triploid)	N
Helianthemum propinquum	Low Rockrose	N
Helianthus hirsutus	Sunflower	N
Helianthus microcephalus	Small Wood Sunflower	N
Helianthus occidentalis	Sunflower	N
Hieracium umbellatum	Umbellate Hawkweed	N
Hierochloe hirta ssp. arctica	Common Northern Sweet Grass	N
Houstonia serpyllifolia	Creeping Bluets	N
Hypericum stragulum	St Andrew's-cross	N
Ilex laevigata	Smooth Winterberry Holly	N
Ipomoea lacunosa	White Morning-glory	N
Iris virginica	Virginia Blue Flag	N
Isoetes valida	Quillwort	N
Isoetes x brittonii	Quillwort	N
Juglans cinerea	Butternut	N
Juncus debilis	Weak Rush	N
Juniperus communis	Common Juniper	N
Lactuca hirsuta	Downy Lettuce	N
Lasius minutus	An Ant	N
Lathyrus venosus	Veiny Pea	N
Lechea minor	Thyme-leaved Pinweed	N
Lemna perpusilla	Minute Duckweed	N
Liatris scariosa	Round-head Gayfeather	N
Linaria canadensis	Old-field Toadflax	N
Lithospermum canescens	Hoary Puccoon	N
Lycopodiella margueritae	A Clubmoss	N
Lycopodiella x copelandii	Copeland's clubmoss	N
Lysimachia hybrida	Lance-leaf Loosestrife	N
Oenothera oakesiana	Evening-primrose	N
Omalotheca sylvatica	Woodland Cudweed	N
Oxysoma cubana	A Sac-spider	N
Panicum polyanthes	Panic-grass	N

Pedicularis lanceolata	Swamp Lousewort	N
Penstemon canescens	Beard-tongue	N
Penstemon laevigatus	Beard-tongue	N
Phaseolus polystachios	Wild Kidney Bean	N
Pinus echinata	Short-leaf Pine	N
Pinus resinosa	Red Pine	N
Piptochaetium avenaceum	Blackseed Needlegrass	N
Platanthera blephariglottis	White Fringed-orchid	N
Polygala nuttallii	Nuttall's Milkwort	N
Polymnia canadensis	Leaf-cup	N
Potamogeton bicupulatus	Pondweed	N
Prenanthes serpentaria	Lion's-foot	N
Prunus alleghaniensis	Alleghany Plum	N
Prunus angustifolia	Chickasaw Plum	N
Pycnanthemum clinopodioides	Mountain-mint	N
Pyrola chlorantha	Green-Flowered Wintergreen	N
Quercus macrocarpa	Bur Oak	N
Quercus michauxii	Swamp Chestnut Oak	N
Ranunculus ambigens	Water-plantain crowfoot	N
Ranunculus flabellaris	Yellow Water-crowfoot	N
Ranunculus pusillus	Spearwort	N
Rosa blanda	Meadow Rose	N
Rosa setigera	Prairie Rose	N
Rudbeckia fulgida	Eastern Coneflower	N
Ruellia pedunculata	Stalked Wild-petunia	N
Sagittaria cuneata	Wapatum Arrowhead	N
Salix caroliniana	Carolina Willow	N
Salix myricoides	Broad-leaved Willow	N
Salix pedicellaris	Bog Willow	N
Schoenoplectus subterminalis	Water Bulrush	N
Singa eugeni	An Orb-weaver Spider	N
Smallanthus uvedalius	Leaf-cup	N
Solidago speciosa var. speciosa	Showy Goldenrod	N
Solidago uliginosa	Bog Goldenrod	N
Sparganium angustifolium	Bur-reed	N
Spiranthes lucida	Shining Ladies'-tresses	N
Stellaria borealis	Mountain Starwort	N
Stenanthium gramineum	Featherbells	N
Strophostyles umbellata	Wild Bean	N
Symphyotrichum drummondii	Hairy Heart-leaved Aster	N
Symphyotrichum praealtum	Veiny-lined Aster	N
Thalictrum dasycarpum	Purple Meadow-rue	N
Toxicodendron rydbergii	Giant Poison-ivy	N
Triadenum walteri	Walter's St. John's-wort	N
Trillium cernuum	Nodding Trillium	N
Trisetum spicatum	Narrow False Oats	N
Utricularia cornuta	Horned Bladderwort	N
Utricularia geminiscapa	Bladderwort	N
Utricularia inflata	Floating Bladderwort	N

Utricularia subulata		N
Veratrum virginicum	Virginia Bunchflower	N
Viola selkirkii	Great-spurred Violet	N
Woodwardia areolata	Netted Chainfern	N
Xyris torta	Twisted Yellow-eyed Grass	N
Zanthoxylum americanum	Northern Prickly-ash	N
Zigadenus glaucus	White Camas	N
Amia calva	Bowfin	PC
Crotalus horridus	Timber Rattlesnake	PC
Culaea inconstans	Brook Stickleback	PC
Emydoidea blandingii	Blanding's Turtle	PC
Ichthyomyzon bdellium	Ohio Lamprey	PC
Lampetra aepyptera	Least Brook Lamprey	PC
Nocomis biguttatus	Hornyhead Chub	PC
Plestiodon laticeps	Broadhead Skink	PC
Umbra limi	Central Mudminnow	PC
Umbra pygmaea	Eastern Mudminnow	PC
Umbra pygmaea	Eastern Mudminnow	PC
Acipenser brevirostrum	Shortnose Sturgeon	PE
Acipenser fulvescens	Lake Sturgeon	PE
Acipenser oxyrinchus	Atlantic Sturgeon	PE
Aconitum reclinatum	White Monkshood	PE
Acorus americanus	Sweet Flag	PE
Acris crepitans	Northern Cricket Frog	PE
Agalinis auriculata	Eared False-foxglove	PE
Agalinis paupercula	Small-flowered False-foxglove	PE
Alasmidonta heterodon	Dwarf Wedgemussel	PE
Alisma triviale	Northern Water-plantain	PE
Alnus viridis	Mountain Alder	PE
Alosa mediocris	Hickory Shad	PE
Ambystoma laterale	Blue-spotted Salamander	PE
Ameiurus melas	Black Bullhead	PE
Amelanchier bartramiana	Oblong-fruited Serviceberry	PE
Ammannia coccinea	Scarlet Ammannia	PE
Anemone cylindrica	Long-fruited Anemone	PE
Arabis missouriensis	Missouri Rock-cress	PE
Ardea alba	Great Egret	PE
Arethusa bulbosa	Swamp-pink	PE
Arnica acaulis	Leopard's-bane	PE
Artemisia campestris ssp. caudata	Beach Wormwood	PE
Asio flammeus	Short-eared Owl	PE
Asplenium resiliens	Black-stemmed Spleenwort	PE
Astragalus neglectus	Cooper's Milk-vetch	PE
Bartramia longicauda	Upland Sandpiper	PE
Boltonia asteroides	Aster-like Boltonia	PE
Botaurus lentiginosus	American Bittern	PE
Cardamine pratensis var. palustris	Cuckooflower	PE
Carex atherodes	Awned Sedge	PE
Carex aurea	Golden-fruited Sedge	PE

Carex bebbii	Bebb's Sedge	PE
Carex bicknellii	Bicknell's Sedge	PE
Carex bullata	Bull Sedge	PE
Carex careyana	Carey's Sedge	PE
Carex collinsii	Collin's Sedge	PE
Carex crinita var. brevicrinis	Short Hair Sedge	PE
Carex eburnea	Ebony Sedge	PE
Carex foenea	A Sedge	PE
Carex formosa	Handsome Sedge	PE
Carex garberi	Elk Sedge	PE
Carex geyeri	Geyer's Sedge	PE
Carex mitchelliana	Mitchell's Sedge	PE
Carex pauciflora	Few-flowered Sedge	PE
Carex polymorpha	Variable Sedge	PE
Carex pseudocyperus	Cyperus-like Sedge	PE
Carex retrorsa	Backward Sedge	PE
Carex typhina	Cattail Sedge	PE
Carex viridula	Green Sedge	PE
Catostomus catostomus	Longnose Sucker	PE
Cerastium velutinum var. villosissimum	Goat Hill Chickweed	PE
Chaenobryttus gulosus	Warmouth	PE
Chasmanthium laxum	Slender Sea-oats	PE
Chenopodium foggii	Fogg's Goosefoot	PE
Chlidonias niger	Black Tern	PE
Chrysogonum virginianum	Green-and-gold	PE
Cirsium horridulum	Horrible Thistle	PE
Cistothorus platensis	Sedge Wren	PE
Cladium mariscoides	Twig Rush	PE
Clematis viorna	Vase-vine Leather-flower	PE
Clethra acuminata	Mountain Pepper-bush	PE
Clitoria mariana	Butterfly-pea	PE
Clonophis kirtlandii	Kirtland's Snake	PE
Conioselinum chinense	Hemlock-parsley	PE
Coregonus artedi	Cisco	PE
Cryptogramma stelleri	Slender Rock-brake	PE
Cryptotis parva	Least Shrew	PE
Cymophyllus fraserianus	Fraser's Sedge	PE
Cynanchum laeve	Smooth Swallow-wort	PE
Cyperus diandrus	Umbrella Flatsedge	PE
Cyperus houghtonii	Houghton's Flatsedge	PE
Cyperus refractus	Reflexed Flatsedge	PE
Cyperus retrorsus	Retrorse Flatsedge	PE
Cypripedium calceolus var. parviflorum	Small Yellow Lady's-slipper	PE
Delphinium exaltatum	Tall Larkspur	PE
Diarrhena obovata	American Beakgrain	PE
Dicentra eximia	Wild Bleeding-hearts	PE
Dichanthelium scoparium	Velvety Panic-grass	PE
Dodecatheon meadia	Common Shooting-star	PE
Dryopteris campyloptera	Mountain Wood Fern	PE

Echinochloa walteri	Walter's Barnyard-grass	PE
Eleocharis caribaea	Capitate Spike-rush	PE
Eleocharis compressa	Flat-stemmed Spike-rush	PE
Eleocharis elliptica	Slender Spike-rush	PE
Eleocharis obtusa var. peasei	Wrights Spike Rush	PE
Eleocharis parvula	Little-spike Spike-rush	PE
Eleocharis pauciflora var. fernaldii	Few-flowered Spike-rush	PE
Eleocharis quadrangulata	Four-angled Spike-rush	PE
Eleocharis rostellata	Beaked Spike-rush	PE
Eleocharis tenuis var. verrucosa	Slender Spike-rush	PE
Elephantopus carolinianus	Elephant's Foot	PE
Empidonax flaviventris	Yellow-bellied Flycatcher	PE
Enneacanthus obesus	Banded Sunfish	PE
Epilobium strictum	Downy Willow-herb	PE
Epioblasma torulosa rangiana	Northern Riffleshell	PE
Epioblasma triquetra	Snuffbox	PE
Equisetum variegatum	Variegated Horsetail	PE
Erimystax x-punctatus	Gravel Chub	PE
Eriophorum gracile	Slender Cotton-grass	PE
Eriophorum tenellum	Rough Cotton-grass	PE
Etheostoma exile	Iowa Darter	PE
Etheostoma pellucida	Eastern Sand Darter	PE
Euphorbia ipecacuanhae	Wild Ipecac	PE
Euphorbia purpurea	Glade Spurge	PE
Eurybia spectabilis	Low Showy Aster	PE
Falco peregrinus	Peregrine Falcon	PE
Festuca paradoxa	Cluster Fescue	PE
Galium labradoricum	Labrador Marsh Bedstraw	PE
Gasterosteus aculeatus	Threespine Stickleback	PE
Gaylussacia dumosa	Dwarf Huckleberry	PE
Geranium bicknellii	Cranesbill	PE
Glaucomys sabrinus	Northern Flying Squirrel	PE
Glyceria borealis	Small-floating Manna-grass	PE
Glyceria obtusa	Blunt Manna-grass	PE
Glyptemys muhlenbergii	Bog Turtle	PE
Gymnopogon ambiguus	Broad-leaved Beardgrass	PE
Helianthemum bicknellii	Bicknell's Hoary Rockrose	PE
Heteranthera multiflora	Multiflowered Mud-plantain	PE
Hieracium traillii	Maryland Hawkweed	PE
Hierochloe odorata	Vanilla Sweet-grass	PE
Huperzia porophila	Rock Clubmoss	PE
Hydrophyllum macrophyllum	Large-leaved Waterleaf	PE
Ichthyomyzon fossor	Northern Brook Lamprey	PE
Ictiobus cyprinellus	Bigmouth Buffalo	PE
Iodanthus pinnatifidus	Purple Rocket	PE
Iris cristata	Crested Dwarf Iris	PE
Iris prismatica	Slender Blue Iris	PE
Iris verna	Dwarf Iris	PE
Isotria medeoloides	Small-whorled Pogonia	PE

Ixobrychus exilis	Least Bittern	PE
Juncus brachycarpus	Short-fruited Rush	PE
Juncus dichotomus	Forked Rush	PE
Juncus militaris	Bayonet Rush	PE
Juncus scirpoides	Scirpus-like Rush	PE
Kinosternon subrubrum subrubrum	Eastern Mud Turtle	PE
Lanius ludovicianus migrans	Migrant Loggerhead Shrike	PE
Lepisosteus oculatus	Spotted Gar	PE
Lepomis megalotis	Longear Sunfish	PE
Lespedeza angustifolia	Narrowleaf Bushclover	PE
Ligusticum canadense	Nondo Lovage	PE
Linum intercursum	Sandplain Wild Flax	PE
Linum sulcatum	Grooved Yellow Flax	PE
Lipocarpha micrantha	Common Hemicarpa	PE
Listera australis	Southern Twayblade	PE
Listera cordata	Heart-leaved Twayblade	PE
Listera smallii	Kidney-leaved Twayblade	PE
Lithobates sphenocephalus utricularius	Southern Leopard Frog	PE
Lithospermum caroliniense	Hispid Gromwell	PE
Lithospermum latifolium	American Gromwell	PE
Lobelia kalmii	Brook Lobelia	PE
Lobelia puberula	Downy Lobelia	PE
Lonicera oblongifolia	Swamp Fly Honeysuckle	PE
Lonicera villosa	Mountain Fly Honeysuckle	PE
Lota lota	Burbot	PE
Ludwigia decurrens	Upright Primrose-willow	PE
Ludwigia polycarpa	False Loosestrife Seedbox	PE
Lycopodiella alopecuroides	Foxtail Clubmoss	PE
Lycopus rubellus	Bugleweed	PE
Lyonia mariana	Stagger-bush	PE
Lythrurus umbratilis	Redfin Shiner	PE
Margaritifera margaritifera	Eastern Pearlshell	PE
Marshallia grandiflora	Large-flowered Marshallia	PE
Matelea obliqua	Oblique Milkvine	PE
Megalodonta beckii	Beck's Water-marigold	PE
Mitella nuda	Naked Bishop's-cap	PE
Monarda punctata	Spotted Bee-balm	PE
Montia chamissoi	Chamisso's Miner's-lettuce	PE
Muhlenbergia uniflora	Fall Dropseed Muhly	PE
Myotis sodalis	Indiana or Social Myotis	PE
Myriophyllum farwellii	Farwell's Water-milfoil	PE
Myriophyllum heterophyllum	Broad-leaved Water-milfoil	PE
Myriophyllum sibiricum	Northern Water-milfoil	PE
Myriophyllum verticillatum	Whorled Water-milfoil	PE
Notropis bifrenatus	Bridle Shiner	PE
Notropis blennius	River Shiner	PE
Notropis buchanani	Ghost Shiner	PE
Notropis chalybaeus	Ironcolor Shiner	PE
Notropis heterodon	Blackchin Shiner	PE

Noturus eleutherus	Mountain Madtom	PE
Noturus gyrinus	Tadpole Madtom	PE
Noturus stigmosus	Northern Madtom	PE
Nyctanassa violacea	Yellow-crowned Night-heron	PE
Nycticorax nycticorax	Black-crowned Night-heron	PE
Obovaria subrotunda	Round Hickorynut	PE
Oclemena nemoralis	Bog Aster	PE
Onosmodium molle var. hispidissimum	False Gromwell	PE
Opheodrys aestivus	Rough Green Snake	PE
Ophioglossum engelmannii	Limestone Adder's-tongue	PE
Packera antennariifolia	Cat's-paw Ragwort	PE
Panicum amarum var. amarulum	Southern Sea-beach Panic-grass	PE
Panicum xanthophysum	Slender Panic-grass	PE
Parnassia glauca	Carolina Grass-of-parnassus	PE
Passiflora lutea	Passion-flower	PE
Paxistima canbyi	Canby's Mountain-lover	PE
Phlox ovata	Mountain Phlox	PE
Phlox subulata ssp. brittonii	Moss Pink	PE
Phoxinus eos	Northern Redbelly Dace	PE
Phyllanthus caroliniensis	Carolina Leaf-flower	PE
Piptatherum pungens	Slender Mountain-ricegrass	PE
Platanthera dilatata	Leafy White Orchid	PE
Pleurobema clava	Clubshell	PE
Poa autumnalis	Autumn Bluegrass	PE
Polemonium vanbruntiae	Jacob's-ladder	PE
Polygala cruciata	Cross-leaved Milkwort	PE
Polygala curtissii	Curtis's Milkwort	PE
Polygala incarnata	Pink Milkwort	PE
Polygonum careyi	Carey's Smartweed	PE
Polystichum braunii	Braun's Holly Fern	PE
Populus balsamifera	Balsam Poplar	PE
Potamogeton friesii	Fries' Pondweed	PE
Potamogeton gramineus	Grassy Pondweed	PE
Potamogeton hillii	Hill's Pondweed	PE
Potamogeton obtusifolius	Blunt-leaved Pondweed	PE
Potamogeton pulcher	Spotted Pondweed	PE
Potamogeton strictifolius	Narrow-leaved Pondweed	PE
Potamogeton tennesseensis	Tennessee Pondweed	PE
Potamogeton vaseyi	Vasey's Pondweed	PE
Potentilla fruticosa	Shrubby Cinquefoil	PE
Potentilla paradoxa	Bushy Cinquefoil	PE
Potentilla tridentata	Three-toothed Cinquefoil	PE
Prenanthes crepidinea	Crepis Rattlesnake-root	PE
Prunus maritima	Beach Plum	PE
Pseudacris kalmi	New Jersey Chorus Frog	PE
Pseudotriton montanus montanus	Eastern Mud Salamander	PE
Ptilimnium capillaceum	Mock Bishop-weed	PE
Pycnanthemum torrei	Torrey's Mountain-mint	PE
Quadrula cylindrica	Rabbitsfoot	PE

Quadrula verrucosa	Pistolgrip Mussel	PE
Quercus falcata	Southern Red Oak	PE
Quercus phellos	Willow Oak	PE
Quercus shumardii	Shumard's Oak	PE
Rallus elegans	King Rail	PE
Ranunculus fascicularis	Tufted Buttercup	PE
Rhamnus lanceolata	Lance-leaved Buckthorn	PE
Rhexia mariana	Maryland Meadow-beauty	PE
Rhododendron atlanticum	Dwarf Azalea	PE
Rhynchospora capillacea	Capillary Beaked-rush	PE
Ribes missouriense	Missouri Gooseberry	PE
Ruellia humilis	Fringed-leaved Petunia	PE
Sagittaria calycina var. spongiosa	Long-lobed Arrow-head	PE
Scaphiopus holbrookii	Eastern Spadefoot	PE
Scheuchzeria palustris	Pod-grass	PE
Schoenoplectus acutus	Hard-stemmed Bulrush	PE
Schoenoplectus smithii	Smith's Bulrush	PE
Schoenoplectus torreyi	Torrey's Bulrush	PE
Scirpus ancistrochaetus	Northeastern Bulrush	PE
Scleria minor	Minor Nutrush	PE
Scleria muehlenbergii	Reticulated Nutrush	PE
Scleria verticillata	Whorled Nutrush	PE
Sedum rosea	Roseroot Stonecrop	PE
Sericocarpus linifolius	Narrow-leaved White-topped Aster	PE
Setophaga striata	Blackpoll Warbler	PE
Shepherdia canadensis	Canada Buffalo-berry	PE
Sida hermaphrodita	Sida	PE
Simpsonaias ambigua	Salamander Mussel	PE
Sistrurus catenatus catenatus	Eastern Massasauga	PE
Sisyrinchium atlanticum	Eastern Blue-eyed Grass	PE
Solidago arguta var. harrisii	Harris' Golden-rod	PE
Solidago curtisii	Curtis' Golden-rod	PE
Solidago erecta	Slender Golden-rod	PE
Solidago simplex ssp. randii var. racemosa	Sticky Golden-rod	PE
Sorbus decora	Showy Mountain-ash	PE
Sparganium androcladum	Branching Bur-reed	PE
Spiranthes casei	Case's Ladies'-tresses	PE
Spiranthes ovalis	October Ladies'-tresses	PE
Spiranthes romanzoffiana	Hooded Ladies'-tresses	PE
Spiranthes vernalis	Spring Ladies'-tresses	PE
Spiza americana	Dickcissel	PE
Sporobolus clandestinus	Rough Dropseed	PE
Sporobolus heterolepis	Prairie Dropseed	PE
Stachys cordata	Nuttall's Hedge-nettle	PE
Sterna hirundo	Common Tern	PE
Swertia caroliniensis	American Columbo	PE
Symphyotrichum boreale	Rush Aster	PE
Taenidia montana	Mountain Pimpernel	PE
Thalictrum coriaceum	Thick-leaved Meadow-rue	PE

Trichostema setaceum	Blue-curls	PE
Trifolium virginicum	Kate's Mountain Clover	PE
Triphora trianthophora	Nodding Pogonia	PE
Triplasis purpurea	Purple Sandgrass	PE
Trollius laxus	Spreading Globeflower	PE
Utricularia radiata	Small Swollen Bladderwort	PE
Vernonia glauca	Tawny Ironweed	PE
Viburnum nudum	Possum-haw	PE
Villosa fabalis	Rayed Bean Mussel	PE
Viola brittoniana	Coast Violet	PE
Amaranthus cannabinus	Waterhemp Ragweed	PR
Andromeda polifolia	Bog-rosemary	PR
Aplectrum hyemale	Puttyroot	PR
Baccharis halimifolia	Eastern Baccharis	PR
Cakile edentula	American Sea-rocket	PR
Carex disperma	Soft-leaved Sedge	PR
Carex lasiocarpa	Slender Sedge	PR
Castanea pumila	Allegheny Chinkapin	PR
Collinsia verna	Spring Blue-eyed Mary	PR
Cyperus schweinitzii	Schweinitz's Flatsedge	PR
Eleocharis olivacea	Capitate Spike-rush	PR
Gaultheria hispidula	Creeping Snowberry	PR
Juncus filiformis	Thread Rush	PR
Juncus gymnocarpus	Coville's Rush	PR
Ledum groenlandicum	Common Labrador-tea	PR
Lupinus perennis	Lupine	PR
Lygodium palmatum	Hartford Fern	PR
Malaxis bayardii	Bayard's Malaxis	PR
Menziesia pilosa	Minniebush	PR
Opuntia humifusa	Prickly-pear Cactus	PR
Orontium aquaticum	Golden Club	PR
Packera anonyma	Plain Ragwort	PR
Panicum commonsianum var. euchlamydeum	Cloaked Panic-grass	PR
Potamogeton robbinsii	Flat-leaved Pondweed	PR
Potamogeton zosteriformis	Flat-stem Pondweed	PR
Pyrularia pubera	Buffalo-nut	PR
Rotala ramosior	Tooth-cup	PR
Sagittaria subulata	Subulate Arrowhead	PR
Schizachyrium scoparium var. littorale	Seaside Bluestem	PR
Schoenoplectus fluviatilis	River Bulrush	PR
Sedum telephioides	Allegheny Stonecrop	PR
Solidago roanensis	Tenessee Golden-rod	PR
Tipularia discolor	Cranefly Orchid	PR
Trautvetteria caroliniensis	Carolina Tassel-rue	PR
Trillium nivale	Snow Trillium	PR
Utricularia purpurea	Purple Bladderwort	PR
Wolffiella gladiata	Bog-mat	PR
Xyris montana	Northern Yellow-eyed Grass	PR
Zizania aquatica	Indian Wild Rice	PR

Aconitum uncinatum	Blue Monkshood	PT
Actaea podocarpa	Mountain Bugbane	PT
Ammophila breviligulata	American Beachgrass	PT
Aneides aeneus	Green Salamander	PT
Arceuthobium pusillum	Dwarf Mistletoe	PT
Aristida purpurascens	Arrow-feathered Three Awned	PT
Asio otus	Long-eared Owl	PT
Asplenium bradleyi	Bradley's Spleenwort	PT
Bidens bidentoides	Swamp Beggar-ticks	PT
Bouteloua curtipendula	Tall Gramma	PT
Camassia scilloides	Wild Hyacinth	PT
Carex alata	Broad-winged Sedge	PT
Carex aquatilis	Water Sedge	PT
Carex cryptolepis	Northeastern Sedge	PT
Carex diandra	Lesser Panicled Sedge	PT
Carex flava	Yellow Sedge	PT
Carex oligosperma	Few-seeded Sedge	PT
Carex paupercula	Bog Sedge	PT
Carex prairea	Prairie Sedge	PT
Carex schweinitzii	Schweinitz's Sedge	PT
Carex sterilis	Sterile Sedge	PT
Carex tetanica	A Sedge	PT
Carex wiegandii	Wiegands Sedge	PT
Chamaesyce polygonifolia	Small Sea-side Spurge	PT
Chrysopsis mariana	Maryland Golden-aster	PT
Circus cyaneus	Northern Harrier	PT
Cypripedium reginae	Showy Lady's-slipper	PT
Dodecatheon radicatum	Jeweled Shooting-star	PT
Eleocharis intermedia	Matted Spike-rush	PT
Eleocharis robbinsii	Robbins' Spike-rush	PT
Ellisia nyctelea	Ellisia	PT
Erigenia bulbosa	Harbinger-of-spring	PT
Eriophorum viridicarinatum	Thin-leaved Cotton-grass	PT
Etheostoma camurum	Bluebreast Darter	PT
Etheostoma maculatum	Spotted Darter	PT
Etheostoma tippecanoe	Tippecanoe Darter	PT
Euthamia tenuifolia	Grass-leaved Goldenrod	PT
Fimbristylis annua	Annual Fimbry	PT
Gaylussacia brachycera	Box Huckleberry	PT
Haliaeetus leucocephalus	Bald Eagle	PT
Hypericum densiflorum	Bushy St. John's-wort	PT
Hypericum majus	Larger Canadian St. John's-wort	PT
Ichthyomyzon greeleyi	Mountain Brook Lamprey	PT
Ilex opaca	American Holly	PT
Juncus alpinoarticulatus ssp. nodulosus	Richardson's Rush	PT
Juncus arcticus var. littoralis	Baltic Rush	PT
Juncus brachycephalus	Small-headed Rush	PT
Juncus torreyi	Torrey's Rush	PT
Lathyrus japonicus	Beach Peavine	PT

Lathyrus ochroleucus	Wild-pea	PT
Linnaea borealis	Twinflower	PT
Lobelia dortmanna	Water Lobelia	PT
Lycopodiella appressa	Southern Bog Clubmoss	PT
Magnolia tripetala	Umbrella Magnolia	PT
Magnolia virginiana	Sweet Bay Magnolia	PT
Melica nitens	Three-flowered Melic-grass	PT
Minuartia glabra	Appalachian Sandwort	PT
Minytrema melanops	Spotted Sucker	PT
Myotis leibii	Eastern Small-footed Myotis	PT
Myrica gale	Sweet-gale	PT
Myriophyllum tenellum	Slender Water-milfoil	PT
Najas gracillima	Bushy Naiad	PT
Neotoma magister	Allegheny Woodrat	PT
Notropis dorsalis	Bigmouth Shiner	PT
Noturus miurus	Brindled Madtom	PT
Nymphoides cordata	Floating-heart	PT
Oenothera argillicola	Shale-barren Evening-primrose	PT
Pandion haliaetus	Osprey	PT
Panicum tuckermanii	Tuckerman's Panic-grass	PT
Percina bimaculata	Chesapeake Logperch	PT
Percina evides	Gilt Darter	PT
Phemeranthus teretifolius	Round-leaved Fame-flower	PT
Phoxinus erythrogaster	Southern Redbelly Dace	PT
Plethobasus cyphyus	Sheepnose Mussel	PT
Poa paludigena	Bog Bluegrass	PT
Potamogeton confervoides	Tuckerman's Pondweed	PT
Potamogeton richardsonii	Red-head Pondweed	PT
Potentilla anserina	Silverweed	PT
Pseudemys rubriventris	Eastern Redbelly Turtle	PT
Ptelea trifoliata	Common Hop-tree	PT
Ribes triste	Red Currant	PT
Ruellia strepens	Limestone Petunia	PT
Salix candida	Hoary Willow	PT
Salix serissima	Autumn Willow	PT
Scirpus pedicellatus	Stalked Bulrush	PT
Scleria pauciflora	Few Flowered Nutrush	PT
Sorex palustris punctulatus	Southern Water Shrew	PT
Spiraea betulifolia	Dwarf Spiraea	PT
Streptopus amplexifolius	White Twisted-stalk	PT
Symphyotrichum depauperatum	Serpentine Aster	PT
Symphyotrichum novi-belgii	New York Aster	PT
Utricularia intermedia	Flat-leaved Bladderwort	PT
Viola appalachiensis	Appalachian Blue Violet	PT
Vittaria appalachiana	Appalachian Gametophyte Fern	PT
Cypripedium calceolus var. pubescens	Large Yellow Lady's-slipper	PV
Hydrastis canadensis	Golden-seal	PV
Panax quinquefolius	Wild Ginseng	PV
Aeschynomene virginica	Sensitive Joint-vetch	PX

Agalinis decemloba	Blue-ridge False-foxglove	PX
Agrostis altissima	Tall Bentgrass	PX
Arctostaphylos uva-ursi	Bearberry Manzanita	PX
Asclepias rubra	Red Milkweed	PX
Berberis canadensis	American Barberry	PX
Buchnera americana	Bluehearts	PX
Carex adusta	Crowded Sedge	PX
Carex backii	Rocky Mountain Sedge	PX
Carex barrattii	Barratt's Sedge	PX
Carex chordorrhiza	Creeping Sedge	PX
Carex hyalinolepis	Shore-line Sedge	PX
Carex sartwellii	Sartwell's Sedge	PX
Chamaecyparis thyoides	Atlantic White Cedar	PX
Commelina erecta	Slender Day-flower	PX
Commelina virginica	Virginia Day-flower	PX
Coreopsis rosea	Pink Tickseed	PX
Crassula aquatica	Water Pigmy-weed	PX
Critesion pusillum	Little Barley	PX
Crotonopsis elliptica	Elliptical Rushfoil	PX
Cynoglossum boreale	Northern Hound's-tongue	PX
Cypripedium candidum	Small White Lady's-slipper	PX
Desmodium sessilifolium	Sessile-leaved Tick-trefoil	PX
Dichanthelium leibergii	Leiberg's Panic-grass	PX
Dichanthelium spretum	Eaton's Witchgrass	PX
Diphasiastrum sabinifolium	Fir Clubmoss	PX
Draba reptans	Carolina Whitlow-grass	PX
Echinacea laevigata	Smooth Coneflower	PX
Elatine americana	Long-stemmed Water-wort	PX
Eleocharis tricostata	Three-ribbed Spike-rush	PX
Eleocharis tuberculosa	Long-tubercled Spike-rush	PX
Elodea schweinitzii	Schweinitz's Waterweed	PX
Erianthus giganteus	Sugar Cane Plumegrass	PX
Eriocaulon decangulare	Ten-angle Pipewort	PX
Eriocaulon parkeri	Parker's Pipewort	PX
Eryngium aquaticum	Marsh Eryngo	PX
Eupatorium leucolepis	White-bracted Thoroughwort	PX
Euphorbia obtusata	Blunt-leaved Spurge	PX
Fimbristylis puberula	Hairy Fimbry	PX
Galactia regularis	Eastern Milk-pea	PX
Galactia volubilis	Downy Milk-pea	PX
Gentiana catesbaei	Elliott's Gentian	PX
Gentianopsis virgata	Lesser Fringed Gentian	PX
Helianthus angustifolius	Swamp Sunflower	PX
Hottonia inflata	American Featherfoil	PX
Hydrocotyle umbellata	Many-flowered Pennywort	PX
Hypericum adpressum	Creeping St. John's-wort	PX
Hypericum crux-andreae	St Peter's-wort	PX
Hypericum denticulatum	Coppery St. John's-wort	PX
Hypericum gymnanthum	Clasping-leaved St. John's-wort	PX

Ilex glabra	Ink-berry	PX
Itea virginica	Virginia Willow	PX
Juncus greenei	Greene's Rush	PX
Koeleria macrantha	Junegrass	PX
Leiophyllum buxifolium	Sand-myrtle	PX
Lemna obscura	Little Water Duckweed	PX
Lemna valdiviana	Pale Duckweed	PX
Lespedeza stuevei	Tall Bush Clover	PX
Limosella australis	Awl-shaped Mudwort	PX
Lobelia nuttallii	Nuttall's Lobelia	PX
Ludwigia sphaerocarpa	Spherical-fruited Seedbox	PX
Micranthemum micranthemoides	Nuttall's Mud-flower	PX
Muhlenbergia capillaris	Short Muhly	PX
Onosmodium virginianum	Virginia False-gromwell	PX
Ophioglossum vulgatum	Adder's Tongue	PX
Phoradendron leucarpum	Christmas Mistletoe	PX
Platanthera cristata	Crested Yellow Orchid	PX
Platanthera leucophaea	Prairie White-fringed Orchid	PX
Polygala lutea	Yellow Milkwort	PX
Populus heterophylla	Swamp Cottonwood	PX
Potamogeton praelongus	White-stemmed Pondweed	PX
Prenanthes racemosa	Glaucous Rattlesnake-root	PX
Proserpinaca pectinata	Comb-leaved Mermaid-weed	PX
Ranunculus hederaceus	Long-stalked Crowfoot	PX
Rhododendron calendulaceum	Flame Azalea	PX
Rhynchospora fusca	Brown Beaked-rush	PX
Rhynchospora gracilenta	Beaked-rush	PX
Ruellia caroliniensis	Carolina Petunia	PX
Sabatia campanulata	Slender Marsh Pink	PX
Sagittaria filiformis	An Arrow-head	PX
Schoenoplectus heterochaetus	Slender Bulrush	PX
Scutellaria serrata	Showy Skullcap	PX
Sisyrinchium fuscatum	Sand Blue-eyed Grass	PX
Smilax pseudochina	Long-stalked Greenbrier	PX
Sparganium natans	Small Bur-reed	PX
Spiraea virginiana	Virginia Spiraea	PX
Spiranthes magnicamporum	Ladies'-tresses	PX
Trifolium reflexum	Buffalo Clover	PX
Triglochin palustris	Marsh Arrowgrass	PX
Utricularia resupinata	Northeastern Bladderwort	PX
Vitis rupestris	Sand Grape	PX
Adiantum aleuticum	Aleutian Maidenhair Fern	TU
Aletris farinosa	Colic-root	TU
Amelanchier humilis	Serviceberry	TU
Amelanchier obovalis	Coastal Juneberry	TU
Amelanchier sanguinea	Roundleaf Serviceberry	TU
Andropogon glomeratus	Bushy Bluestem	TU
Antennaria solitaria	Single-headed Pussy-toes	TU
Arabis hirsuta	Western Hairy Rock-cress	TU

Aristida dichotoma var. curtissii	Three-awned Grass	TU
Aristida longespica var. geniculata	Spiked Needlegrass	TU
Asclepias variegata	White Milkweed	TU
Carex buxbaumii	Brown Sedge	TU
Carex crawfordii	Crawford's Sedge	TU
Carex haydenii	Cloud Sedge	TU
Carex limosa	Mud Sedge	TU
Carex longii	Long's Sedge	TU
Carex lupuliformis	False Hop Sedge	TU
Carex meadii	Mead's Sedge	TU
Castilleja coccinea	Scarlet Indian-paintbrush	TU
Chasmanthium latifolium	Wild Oat	TU
Chenopodium capitatum	Strawberry Goosefoot	TU
Coeloglossum viride	Long-bracted Green Orchid	TU
Corallorhiza wisteriana	Spring Coral-root	TU
Crataegus brainerdii	Brainerd's Hawthorne	TU
Crataegus mollis	Downy Hawthorne	TU
Cuscuta cephalanthi	Button-bush Dodder	TU
Cuscuta coryli	Hazel Dodder	TU
Cuscuta polygonorum	Smartweed Dodder	TU
Cystopteris laurentiana	Laurentian Bladder-fern	TU
Desmodium glabellum	Tall Tick-trefoil	TU
Desmodium nuttallii	Nuttalls' Tick-trefoil	TU
Dichanthelium annulum	Serpentine Panic-grass	TU
Dichanthelium boreale	Panic-grass	TU
Dichanthelium commonsianum var. commonsianum	Cloaked Panic Grass	TU
Dichanthelium lucidum	Shining Panic-grass	TU
Dichanthelium villosissimum var. villosissimum	Long-haired Panic-grass	TU
Dichanthelium yadkinense	Yadkin River Panic-grass	TU
Elatine minima	Small Waterwort	TU
Epilobium palustre	Marsh Willow-herb	TU
Eupatorium rotundifolium	A Eupatorium	TU
Filipendula rubra	Queen-of-the-prairie	TU
Gentiana alba	Yellow Gentian	TU
Gentiana saponaria	Soapwort Gentian	TU
Gentiana villosa	Striped Gentian	TU
Goodyera tesselata	Checkered Rattlesnake-plantain	TU
Gratiola aurea	Golden Hedge-hyssop	TU
Gymnocarpium appalachianum	Appalachian Oak Fern	TU
Houstonia purpurea var. purpurea	Purple Bluets	TU
Hypericum drummondii	Nits-and-lice	TU
Juncus biflorus	Grass-leaved Rush	TU
Lathyrus palustris	Vetchling	TU
Lemna turionifera	A Duckweed	TU
Leucothoe racemosa	Swamp Dog-hobble	TU
Lonicera hirsuta	Hairy Honeysuckle	TU
Luzula bulbosa	Southern Wood-rush	TU
Lythrum alatum	Winged-loosestrife	TU
Malaxis monophyllos var. brachypoda	White Adder's-mouth	TU

Meehania cordata	Heartleaf Meehania	TU
Muhlenbergia cuspidata	Plains Muhlenbergia	TU
Nuphar microphylla	Yellow Cowlily	TU
Oxydendrum arboreum	Sourwood	TU
Oxypolis rigidior	Stiff Cowbane	TU
Packera plattensis	Prairie Ragwort	TU
Panicum flexile	Wiry Witchgrass	TU
Panicum longifolium	Long-leaf Panic-grass	TU
Paronychia fastigiata var. nuttallii	Forked-chickweed	TU
Parthenium integrifolium	American Fever-few	TU
Phlox pilosa	Downy Phlox	TU
Phyla lanceolata	Lance Fog-fruit	TU
Physalis virginiana	Virginia Ground-cherry	TU
Platanthera ciliaris	Yellow-fringed Orchid	TU
Platanthera hookeri	Hooker's Orchid	TU
Platanthera peramoena	Purple-fringeless Orchid	TU
Pluchea odorata	Shrubby Camphor-weed	TU
Poa languida	Drooping Bluegrass	TU
Podostemum ceratophyllum	Riverweed	TU
Polygala polygama	Racemed Milkwort	TU
Polygonella articulata	Eastern Jointweed	TU
Polygonum amphibium var. stipulaceum	A Water Smartweed	TU
Polygonum ramosissimum	Bushy Knotweed	TU
Potamogeton filiformis	Slender Pondweed	TU
Potamogeton illinoensis	Illinois Pondweed	TU
Potamogeton oakesianus	Oakes' Pondweed	TU
Pycnanthemum verticillatum var. pilosum	Hairy Mountain-mint	TU
Ranunculus flammula	Lesser Spearwort	TU
Ratibida pinnata	Gray-headed Prairie Coneflower	TU
Rhamnus alnifolia	Alder-leaved Buckthorn	TU
Rhynchospora recognita	Small Globe Beaked-rush	TU
Ribes lacustre	Swamp Currant	TU
Rosa virginiana	Virginia Rose	TU
Rubus cuneifolius	Sand Blackberry	TU
Rubus setosus	Small Bristleberry	TU
Rumex hastatulus	Heart-winged Sorrell	TU
Salix petiolaris	Meadow Willow	TU
Samolus parviflorus	Pineland Pimpernel	TU
Saxifraga micranthidifolia	Lettuce Saxifrage	TU
Scleria triglomerata	Whip Nutrush	TU
Scutellaria saxatilis	Rock Skullcap	TU
Senna marilandica	Wild Senna	TU
Sisyrinchium albidum	Blue-eyed Grass	TU
Solidago rigida	Hard-leaved Goldenrod	TU
Spiranthes tuberosa	Little Ladies'-tresses	TU
Stachys hyssopifolia	Hyssop Hedge-nettle	TU
Stylosanthes biflora	Pencilflower	TU
Symphyotrichum dumosum	Bushy Aster	TU
Symphyotrichum ericoides	White Heath Aster	TU

Symphyotrichum firmum	Firm Aster	TU
Taxus canadensis	American Yew	TU
Tradescantia ohiensis	Ohio Spiderwort	TU
Trillium flexipes	Declined Trillium	TU
Triosteum angustifolium	Horse-gentian	TU
Tripsacum dactyloides	Eastern Gamma-grass	TU
Uvularia pudica	Mountain Bellwort	TU
Viburnum trilobum	Highbush-cranberry	TU
Viola renifolia	Kidney-leaved White Violet	TU
Viola tripartita	Three-parted Violet	TU
Vitis cinerea var. baileyana	A Pigeon Grape	TU
Wolffia borealis	Dotted Water-meal	TU

[2] In the Commonwealth of Pennsylvania, plants, wild birds and mammals, and fish, amphibians, reptiles, and aquatic organisms fall under the jurisdiction of three different authorities. Each authority, as outlined below, has different definitions for listing status.

Plant Status Codes and Definitions:
Native Plant Species Legislative Authority: Title 17 Chapter 45, Conservation of Native Wild Plants, January 1, 1988; Pennsylvania Department of Conservation and Natural Resources.

PE (Pennsylvania Endangered): Plant species which are in danger of extinction throughout most of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that have been classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.

PT (Pennsylvania Threatened): Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.

PR *(Pennsylvania Rare)*: Plant species which are uncommon within this Commonwealth. All species of the native wild plants classified as Disjunct, Endemic, Limit of Range and Restricted are included within the Pennsylvania Rare classification. Disjunct: significantly separated from their main area of distribution, Endemic: confined to a specialized habitat, Limit of Range: at or near the periphery of their natural distribution, Restricted: found in specialized habitats or habitats infrequent in Pennsylvania.
PX *(Pennsylvania Extirpated)*: Plant species believed by the Department to be extinct within this Commonwealth. These plants may or may not be in existence outside the Commonwealth.

PV *(Pennsylvania Vulnerable)*: Plant species which are in danger of population decline within Commonwealth because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.

TU *(Tentatively Undetermined)*: A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxanomic uncertainties, limited evidence within historical records, or insufficient data.

N: No current legal status exists, but is under review for future listing.

Wild Birds and Mammals Status Codes and Definitions:
Wild Birds and Mammals Legislative Authority: Title 34 Chapter 133, Game and Wildlife Code, revised Dec. 1, 1990, Pennsylvania Game Commission.

PE *(Pennsylvania Endangered)*: Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are: 1) species whose numbers have already been reduced to a critically low level or whose habitat has been so drastically reduced or degraded that immediate action is required to prevent their extirpation from the Commonwealth; or 2) species whose extreme rarity or peripherality places them in potential danger of precipitous declines or sudden extirpation throughout their range in Pennsylvania; or 3) species that have been classified as "Pennsylvania Extirpated", but which are subsequently found to exist in Pennsylvania as long as the above conditions 1 or 2 are met; or 4) species determined to be "Endangered" pursuant to the Endangered Species Act of 1973, Public Law 93 205 (87 Stat. 884), as amended.

PT *(Pennsylvania Threatened)*: Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated. These are: 1) species whose populations within the Commonwealth are decreasing or have been heavily depleted by adverse factors and while not actually endangered, are still in critical condition; 2) species whose populations may be relatively abundant in the Commonwealth but are under severe threat from serious adverse factors that have been identified and documented; or 3) species whose populations are rare or peripheral and in possible danger of severe decline throughout their range in Pennsylvania; or 4) species determined to be "Threatened" pursuant to the Endangered Species Act of 1973, Public Law 93205 (87 Stat. 884), as amended, that are not listed as "Pennsylvania Endangered".

Fish, Amphibians, Reptiles, and Aquatic Organisms Status Codes and Definitions:
Fish, Amphibians, Reptiles, and Aquatic Organisms Legislative Authority: Title 30, Chapter 75, Fish and Boat Code, revised February 9, 1991; Pennsylvania Fish Commission.

PE *(Pennsylvania Endangered)*: All species declared by: 1) the Secretary of the United States Department of the Interior to be threatened with extinction and appear on the Endangered Species List or the Native Endangered Species List published in the Federal Register; or 2) have been declared by the Pennsylvania Fish Commission, Executive Director to be threatened with extinction and appear on the Pennsylvania Endangered Species List published by the Pennsylvania Bulletin.

PT *(Pennsylvania Threatened)*: All species declared by: 1) the Secretary of the United States Department of the Interior to be in such small numbers throughout their range that they may become endangered if their environment worsens, and appear on a Threatened Species List published in the Federal Register; or 2) have been declared by the Pennsylvania Fish Commission Executive Director to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on the Pennsylvania Threatened Species List published in the Pennsylvania Bulletin.

PC: Animals that could become endangered or threatened in the future. All of these are uncommon, have restricted distribution or are at risk because of certain aspects of their biology.

N: No current legal status, but is under review for future listing.