

ENVIRONMENTAL ASSESSMENT

**White-tailed Deer Damage Management in
Pennsylvania**

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List of Acronyms

| | |
|--------|---|
| ADC | Animal Damage Control |
| AMDUCA | Animal Medicinal Drug Use Clarification Act |
| APHIS | Animal and Plant Health Inspection Service |
| BCC | Biological Carrying Capacity |
| CCC | Cultural Carrying Capacity |
| CDC | Center for Disease Control |
| CEQ | Council on Environmental Quality |
| CWD | Chronic Wasting Disease |
| DCNR | Department of Conservation of Natural Resources |
| DEA | Drug Enforcement Administration |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| ESA | Endangered Species Act |
| FEIS | Final Environmental Impact Statement |
| HGE | Human granulocytic ehrlichiosis |
| HME | Human monocytic ehrlichiosis |
| IWDM | Integrated Wildlife Damage Management |
| MBTA | Migratory Bird Treaty Act |
| MIS | Management Information Systems |
| MOU | Memorandums of Understanding |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NOA | Notice of Availability |
| NWRC | National Wildlife Research Center |
| PDA | Pennsylvania Department of Agriculture |
| PGC | Pennsylvania Game Commission |
| SOP | Standard Operating Procedures |
| T & E | Threatened and Endangered (species) |
| USDA | United States Department of Agriculture |
| USFWS | U.S. Fish and Wildlife Service |
| WS | Wildlife Services (USDA, APHIS) |

1.0 CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

Within Pennsylvania and across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife that increases the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The *Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (United States Department of Agriculture (USDA) 1997):

"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."

WS is a cooperatively funded, service-oriented program from which other governmental agencies and entities may request assistance. Before any wildlife damage management is conducted, Cooperative Agreements, Agreements for Control or other comparable documents are in place. As requested, WS cooperates with 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. WS's mission, developed through its strategic planning process, is: 1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety."* WS's Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- training of wildlife damage management professionals;
- development and improvement of strategies to reduce losses and threats to humans from wildlife;
- collection, evaluation, and dissemination of management information;
- informing and educating the public on how to reduce wildlife damage; and
- providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1999).

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). Wildlife Services (WS) uses an Integrated Wildlife Damage Management (IWDM) approach, known as Integrated Pest Management (WS Directive 2.1051), in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1:1-7 of USDA (1997). 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.

This environmental assessment (EA) documents the analysis of the potential environmental effects of a proposed integrated white-tailed deer (*Odocoileus virginianus*) damage management program to alleviate damage to agriculture, property, natural resources, and human health and safety. This analysis relies mainly on existing data contained in published documents (Appendix A), including the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997). USDA 1997 may be obtained by contacting the USDA, Animal and Plant Health Inspection Service (APHIS), WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

The authority for management of resident wildlife species is the responsibility of the Pennsylvania Game Commission (PGC). The PGC collects and compiles information on white-tailed deer population trends and take, and uses this information to manage deer populations. This information has been provided to WS to assist in the analysis of potential impacts of WS activities on the deer herd in Pennsylvania.

WS is a federal agency authorized to protect American resources from damage associated with wildlife (Animal Damage Control Act of March 2, 1931, as amended 46 Stat. 1486; 7 USC. 426-426c and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988, Public law 100-102, Dec. 27, 1987. Stat. 1329-1331 (7 USC 426C) and the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act of 2001, Public Law 106-387, October 28, 2000. Stat. 1549 (Sec 767)). To fulfill this Congressional direction, 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 as one means of 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. Wildlife Service'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.

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions may be

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.

categorically excluded (7 CFR 372.5(c), 60 Fed. Reg. 6,000- 6,003, (1995)). WS has decided in this case to prepare this EA to facilitate planning, interagency coordination, and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed and planned damage management program. All wildlife damage management that would take place in Pennsylvania would be undertaken according to relevant laws, regulations, policies, orders and procedures, including the Endangered Species Act (ESA). Notice of the availability of this document will be made available consistent with the agency's NEPA procedures.

1.2 Preferred Alternative

Wildlife Services proposes to continue the current damage management program that responds to requests for white-tailed deer damage assistance in the Commonwealth of Pennsylvania. An Integrated Wildlife Damage Management (IWDM) approach would be implemented in consultation and coordination with the Pennsylvania Game Commission (PGC) to alleviate white-tailed deer damage to agriculture, property, natural resources, and human health and safety on all private and public lands of Pennsylvania where a need exists, assistance is requested from landowners or public officials, 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, white-tailed deer, other species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods (see Appendix B) by applying the WS Decision Model (Slate et al. 1992). When appropriate, habitat modifications, harassment, repellents, and physical exclusion could be recommended and utilized to reduce deer damage. In other situations, deer would be removed as humanely as possible by sharp shooting and 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 nonlethal methods. However, nonlethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of nonlethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Deer damage management would be conducted in the Commonwealth, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed. All deer damage management would be consistent with other uses of the area and would comply with appropriate federal, state and local laws.

1.3 Purpose

The purpose of this EA is to address and evaluate the potential impacts to the human environment from the implementation of a WS white-tailed deer damage management program. The program is primarily directed to the alleviation of deer damage and conflicts associated with agricultural resources, urban/suburban landscaping, property, natural resources, human safety from deer-vehicle and deer-aircraft collisions, and concerns about the spread of disease. Under the Preferred Alternative (Integrated Deer

Damage Management Program), deer damage management could be conducted on private, federal, state, tribal, county, and municipal lands in the commonwealth of Pennsylvania upon request for WS assistance.

1.4 Background and Need for Action

1.4.1 History of White-tailed Deer Management in Pennsylvania

In Pennsylvania, game wardens began enforcing the deer harvest law in 1896 and the Pennsylvania Game Commission (PGC) began stocking deer in 1906 (Kosack 1995). Early successional habitat that provided excellent deer habitat became abundant throughout Pennsylvania due to logging practices that occurred during the late 1800s and early 1900s. Excellent habitat coupled with limited antlerless harvests allowed deer herds to expand throughout the Commonwealth and dramatically increase in number (PGC 2003).

The PGC closed the antlerless deer hunting season throughout the Commonwealth in 1956 because deer densities were low and hunters complained that an over-harvest occurred in 1955 (Kosack 1995). Deer density goals based on forage availability in forested habitats were established by the PGC in 1979. Deer densities fluctuated but generally increased throughout the 1980s and 1990s. Deer numbers were 50% to greater than 100% above goal throughout the Commonwealth (PGC 2003).

Since 1907, Pennsylvania had a 2-week buck season followed by a 3-day antlerless season. In 2001, the seasons were combined to maximize hunter opportunities for harvesting antlerless deer (PGC 2003). In 2002, the Board of Game Commissioners approved new antler restrictions for the 2002-2003 hunting season. In the counties of Armstrong, Beaver, Bulter, Crawford, Erie, Indiana, Lawrence, Mercer, Washington, and Westmorland, a legal buck would be a deer with four or more points on one antler. In the remainder of the state, a legal buck would be a deer with three or more points on one antler. The only exceptions are Special Regulation Area counties, and for junior license holders, disabled hunters with a permit to use a vehicle, and active duty U.S. Armed Services personnel. These license holders will be able to abide by the previous antler restrictions (two or more points to one antler or one antler three inches or more in length) (PGC 2003).

1.4.2 Ecology, Behavior and Population Status

The white-tailed deer is one of the most ubiquitous and well-known wild animals in Pennsylvania, and its large population has a huge effect on other kinds of wildlife and on the natural environment as a whole (Fergus 2000). In Pennsylvania, the average adult male (buck) weighs 140 pounds and stands about 33 inches at the shoulder. A typical deer is 70 inches from the tip of its nose to the base of its tail. Females (does) are smaller and weigh less than males. Deer weights vary considerably, depending on age, sex, diet, and season of the year (Fergus 2000).

Male deer have antlers that are made of bone and are connected to the skull. Antlers begin developing in March or April. They are covered by a layer of skin, the velvet,

richly supplied with nutrient-carrying blood vessels. In August or early September, antler growth stops, the velvet is shed, and the buck carries his antlers throughout the fall breeding season. As the buck's testosterone levels dwindle, a separation layer forms between the antlers and skull. In January or February the antlers fall off and the buck grows new antlers each year (Fergus 2000). Antler growth is based on several factors; genetics, age of the deer, and food quantity and quality. Typically, bucks with larger antlers are more pleasing to the public for aesthetic reasons or for recreational purposes.

Deer are strictly plant eaters. A Pennsylvania study of food items in the rumens (stomachs) of road-killed deer identified ninety-eight different plant species. Deer eat leaves and twigs from a vast assortment of woody plants, including aspen, ash, beech, birch, dogwood, maple, oak, willow, witch hazel, pine, and hemlock (Fergus 2000). Deer grub out the corms of ferns, nibble on lichens, strip bark from trees, and consume lily pads and pond plants. Deer eat garden vegetables, wild mushrooms, fruits such as apples and pears, and crops, including soybeans, corn, and alfalfa. Acorns are a favorite food, and deer consume them in great quantities when putting on fat for winter. A deer will eat 5 to 9 pounds of food daily (Fergus 2000).

Deer breed from October to January. The rut peaks in mid- to late November, and most adult females have been bred by the end of December. Most does bear their fawns from late May to early June, after approximately two hundred days of gestation. Year-old does may have one fawn, and older does generally have twins and, sometimes, triplets. Fawns weigh 4 to 8 pounds at birth. They nurse almost immediately and can walk within an hour (Fergus 2000).

An ideal habitat is brush-stage forest with a wide variety of tree and plant species. White-tailed deer are highly adaptable and live in many habitats, including woodlots in farming country, suburbs, and deep woods. Deer live out their entire lives in the same home range, about 40 acres in good habitat to over 300 acres in marginal habitat. Mature bucks usually have larger home ranges than those of does and younger deer (Fergus 2000).

The biological carrying capacity (BCC) of a wildlife population is defined as the maximum number of animals that an area can support without degradation to the animal's health and the environment over an extended period of time. 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 overbrowsing of plant species preferred as food by deer (Kroll et al. 1986). Overbrowsing negatively impacts the habitat and landscape, and overall animal health declines due to less nutritious food items being available.

The cultural carrying capacity (CCC) is defined as the maximum density of a given species that can coexist compatibly with the local human population (Decker and Purdy 1988). This term is useful because it defines when conflicts with deer have exceeded an acceptable level, and provides managers with a target for establishing management objectives. Certain factors may influence the CCC, such as landscape or vegetation impacts, threats to public safety, the potential for illegal killing of deer, and personal

attitudes and values. The threshold of wildlife damage acceptance is a primary limiting factor in determining the CCC.

For any given damage situation, there will be varying acceptance thresholds by those directly, as well as indirectly, affected by the damage. Both the CCC and BCC are important factors in managing conflicts between humans and deer.

In 2002, the estimated white-tailed deer population in Pennsylvania was 1.5 million (Per. Comm. Brett Wallingford 2003). The Pennsylvania deer population is estimated on three criteria, which include; population modeling, harvest trend analysis, and monitoring vital statistics of the deer herd. Currently, the deer populations in all management units in Pennsylvania are significantly higher than the PGC desires. Therefore, agency policy-makers adopted a course of action to reduce the deer herd size by 2% over the next year (Per. Comm. Brett Wallingford 2003).

1.4.3 Harvest Information for Deer in Pennsylvania

Deer hunting regulations, in Pennsylvania, vary throughout the commonwealth by county, time of year, arms and ammunition, and age of the hunter. The following is a break-down of the 2003-2004 deer hunting seasons in Pennsylvania.

Archery (Antlered and Antlerless): Statewide Oct. 4-Nov.15 and Dec. 26-Jan.10. One antlered deer per hunting license year. One antlerless deer with each required antlerless license.

Antlered and Antlerless: Statewide Dec. 1-13. One antlered deer per hunting license year. An antlerless deer with each required antlerless license.

Antlerless: Statewide Oct. 23-25. 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 only, with required antlerless license. Also included are persons who have reached or will reach their 65th birthday in the year of the application for a license and hold a valid adult license, or qualify for a license and fee exemptions under section 2706. One antlerless deer with each required antlerless license.

Muzzleloader (Antlerless): Statewide Oct. 18-25. An antlerless deer with each required antlerless license.

Flintlock (Antlered or antlerless): Statewide Dec. 26-Jan.10. One antlered deer per hunting license year, or one antlerless deer and an additional antlerless deer with each required antlerless license.

Antlerless (Military Bases): Hunting permitted on days established by the U.S. Department of the Army at Lekkerkenny Army Depot, Franklin County; New Cumberland Army Depot, York County; and Fort Detrick, Raven Rock Site, Adams County. An antlerless deer with each required antlerless license.

In 2002-2003, hunters harvested 517,529 deer. The antlered harvest was 165,416 and the antlerless harvest was 352,113. Bowhunters took 69,648 deer (33,476 antlered and 36,172 antlerless), 13% of the total harvest. Rifle hunters took 415,241 deer (130,661 antlered and 284,580 antlerless), 80% of the total harvest; and flintlock hunters harvested 32,640 deer (2,127 antlered and 23,690 antlerless), 6% of the total harvest (PGC 2003).

1.4.4 Deer Damage to Agriculture

The estimated economic loss from deer depredation to high-value agricultural crops from 1994-2000 in Pennsylvania was \$17,506,294 (Drake et. al 2003). High-value agricultural crops included fresh market and processed vegetables, including but not limited to snap beans, sweet corn, leafy vegetables, tomatoes, and peppers. Apples and peaches were also included as high-value crops (Drake et. al 2003). The estimated economic loss from deer depredation to grain crops from 1995-2000 in Pennsylvania was \$25,738,984 (Drake et. al 2003). Grain crops included corn (silage and grain), soybeans, wheat, and oats (Drake et. al 2003). The number of deer killed under crop damage or nuisance permits in Pennsylvania has increased yearly from 1998 to 2001 (2653, 3190, 4659, and 5022 respectively) (Per. Comm. Brett Wallingford, PGC 2003).

1.4.5 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 1997, Conover et al. 1995, Romin and Bissonette 1996). The economic costs associated with deer-vehicle collisions include vehicle repairs, human injuries and fatalities, and picking up and disposing of deer (Drake et. al 2003). Conover et. al (1995) estimated that more than 1 million deer-vehicle collisions occur annually in the United States, costing over \$1.1 billion in repair costs, and resulting in 29,000 human injuries and 211 human fatalities. In a summary of vehicle-accident costs the average vehicle repair bill was nearly \$2,389 in Pennsylvania (Witmer and DeCalesta 1992). The estimated annual total cost to repair vehicle damage from deer-vehicle collisions from 1986-2000 in Pennsylvania was \$150,000,000 (Drake et. al 2003).

Often, deer-vehicle collisions in which a deer carcass was not recovered or little vehicle damage occurred go unreported. A Cornell University study estimates that the actual number of deer-vehicle collisions could be as high as six times the reported number (Decker et al. 1990). As Keith McCaffery (a retired deer biologist from Wisconsin) put it; "Seeing deer in the forest used to be a magical experience, now it's exciting only if they're coming through your windshield (Ness 2003).

1.4.6 Deer Hazards at Airports

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

Deer-aircraft strikes can result in loss of human life, injury to passengers or people on the ground, damage or malfunction of aircraft, aircraft navigational aids, or airport facilities. Mammals colliding with aircraft during the most vulnerable phases of flight, takeoff or

landing, can cause the aircraft to crash or sustain physical damage (USDA 1998). Mammals are characteristically unpredictable in their initial response to approaching aircraft. Deer may wander onto runway surfaces and be startled into the path of oncoming aircraft, and at night, they may freeze when caught in the beams of landing lights, resulting in a strike. The majority of deer strikes occur at night and in the fall during the mating season (Dolbeer et al. 1995).

White-tailed deer are a commonly encountered problem at airfields in Pennsylvania, threatening the safe operation of aircraft at those facilities. Collisions between deer and aircraft can cause major damage to the aircraft, and potentially cause injury and loss of human life. Serious consequences are also possible if pilots lose control of the aircraft while attempting to avert a collision with deer. From 1990 through 2000 there were 500 reported deer-aircraft strikes to civil aircraft in the U. S. (reporting is not mandatory and it is estimated that less than 20% of strikes are reported) (USDA 1998).

The risk that deer pose to aircraft is well documented; the following are just a few examples of deer/aircraft strikes:

- On November 17, 1998, a private jet with 30 passengers was departing from Elko Nevada, when the bottom of the engine cowling struck a white-tailed deer, knocking off an antler. The entire antler was sucked into the engine forcing the plane to circle the airfield and land. The passengers were safely off-loaded, but the engine was destroyed. Damage was estimated at \$300,000 (USDA 1998).
- On March 2, 1998, a Jetstream commuter in Johnstown, Pennsylvania, collided with multiple white-tailed deer which caused the left main mount to collapse and the aircraft to lose control and roll off the runway with ten passengers and crew on board. The incident required emergency procedures and demonstrated the seriousness of the deer-aircraft collision hazard to public safety (USDA 1998).
- On January 11, 1990, a Hawker Siddeley struck several deer during take off in Tennessee. One of the deer was completely ingested into the left engine. The impact tore the engine loose from the aircraft. The aircraft was replaced at a cost of 1.4 million dollars (Cleary et. al 2002).
- On January 2, 1992, a Piper 28 in Minnesota collided with a deer just prior to touchdown. The pilot added power and aborted the landing. Loss of engine power was experienced during the climb and the aircraft crashed into trees then the ground a ¼ mile south of the airport. The pilot was seriously injured and the aircraft was destroyed (Cleary et. al 2002).
- On December 6, 2000, an Embraer 120 in West Virginia collided with two deer just after landing. The tip of a propeller blade separated and punctured the fuselage, injuring a passenger, who later died (Cleary et. al 2002).

Bird and mammal strikes to aircraft have been reported in all 50 states, with Pennsylvania being one of five states that reported the most mammal strikes. From 1990-2001, reports were received of 18 mammal strikes that resulted in 24 human injuries and 1 fatality. Deer were responsible for 89% of these mammal strikes that resulted in death or injury (FAA 2003). From 1990-2001, there were 450 deer-aircraft strikes to civil aircraft that resulted in damage and reported costs of civil aircraft strikes by white-tailed deer totaled \$17,251,333 (FAA 2003).

1.4.7 Damage to Landscaping and Natural Resources

Deer are considered a "keystone species," one that can have a profound impact on vegetation, altering species composition to the point that entire forests either fail to regenerate, or regenerate with tree species that are not beneficial for deer or other species of wildlife, or for lumber (Wallingford 2002). Deer browsing damages and destroys landscaping and ornamental trees, shrubs, and flowers. The estimated economic loss from deer depredation to nursery stock from 1997-2000 in Pennsylvania was \$4,303,200 (Drake et.al 2003). 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). Furthermore, deer are prolific and adaptable, characteristics that allow them to exploit and prosper in most suitable habitat near urban areas, including residential areas (Jones and Witham 1990). The succulent nature of many ornamental landscape plants, coupled with high nutrient contents from fertilizers, offers an attractive food source for deer. 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.

Deer overabundance can affect native vegetation and natural ecosystems in addition to ornamental landscape plantings. White-tailed deer selectively forage on vegetation (Strole and Anderson 1992), and thus can have substantial impacts on certain herbaceous and woody species and on overall plant community structure (Waller and Alverson 1997). These changes can lead to adverse impacts on other wildlife species, which depend on these plants for food and/or shelter. Numerous studies have shown that over browsing by deer can decrease tree reproduction, understory vegetation cover, plant density, and plant diversity (Warren 1991). By one count, 98 species of threatened and endangered plants, many of them orchids and lilies, are disturbed by deer browsing (Ness 2003). In the Great Smokey Mountains National Park in Tennessee, an area heavily populated by deer had a reduction in the number of plant species, a loss of hardwood species and a predominance of conifer species compared to an ecologically similar control area with fewer deer (Bratton 1979). In a single park in Columbus, Ohio, a deer herd eradicated more than 150 plant species (Ness 2003).

The alteration and degradation of habitat from over-browsing by deer can have a detrimental effect on deer herd health and may displace other wildlife communities (e.g., neotropical migrant songbirds and small mammals) that depend upon the understory vegetative habitat destroyed by deer browsing (VDGIF 1999). Similarly, DeCalesta (1997) reported that deer browsing affected vegetation that songbirds need for foraging

surfaces, escape cover, and nesting. Species richness and abundance of intermediate canopy nesting songbirds was reduced in areas with higher deer densities (DeCalesta 1997). Intermediate canopy-nesting birds declined 37% in abundance and 27% in species diversity at higher deer densities. Five species of birds were found to disappear at densities of 38.1 deer per square mile and another two disappeared at 63.7 deer per square mile. Casey and Hein (1983) found that 3 species of birds were lost in a research preserve stocked with high densities of ungulates and that the densities of several other species of birds were lower than in an adjacent area with lower deer density. (Both DeCalesta and Casey and Hein's study area were located in Pennsylvania.) 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.

1.4.8 Threats to Human and Livestock Health and Safety from Disease Transmission

Lyme Disease: Currently, the most common zoonosis involving deer is Lyme disease, caused by the spirochete *Borrelia burgdorferi* and vectored to humans by the deer tick (*Ixodes dammini* in the eastern U.S.) (Conover 1997). Initial symptoms of Lyme disease include a flu-like illness with headache, fever, muscle or joint pain, neck stiffness, swollen glands, jaw discomfort, and inflammation of the eye membranes (McLean 1994). If left untreated, heart, nervous system, and joint manifestations may develop (McLean 1994).

Research has shown a 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 the adult deer tick (Conover 1997). The Montgomery County Health Department, Pennsylvania (MCHD) cites that Lyme disease incidence has also been linked to landscape features such as wooded, residential areas versus developed, urban areas (MCHD 2000). In 1999, 16,273 cases of Lyme disease were reported to the CDC. Ninety-two percent of these cases were from Connecticut, Rhode Island, New York, Pennsylvania, Delaware, New Jersey, Maryland, Massachusetts, and Wisconsin (CDC 2003). In Pennsylvania, from 1990-1999, there were 17, 072 reported cases of Lyme disease (CDC 2003).

In 1986, another serious tick-borne zoonosis, human ehrlichiosis, was discovered in the United States (McQuiston et al. 1999). Two distinct forms of the illness may affect humans: human monocytic ehrlichiosis (HME) and human granulocytic ehrlichiosis (HGE) (McQuiston et al. 1999, Lockhart et al. 1997). The bacterial agents that cause ehrlichiosis are transmitted to humans by infected ticks that acquire the agents from feeding on infected animal reservoirs (McQuiston et al. 1999). Ehrlichiosis in humans may result in fever, headache, myalgia, nausea, and occasionally death (McQuiston et al. 1999, Little et al. 1998). HME is the type of ehrlichiosis predominantly found in the southeastern, south-central, and mid-Atlantic U.S. White-tailed deer are major hosts for *Amblyomma americanum*, the tick that transmits HME, and deer have been identified as a reservoir for HME (Little et al. 1998, Lockhart et al. 1997).

Bovine Tuberculosis: Tuberculosis is a contagious disease of both animals and humans and can be caused by three specific types of the Mycobacterium bacteria. 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.

Pathogenesis of *M. bovis* infection in white-tailed 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.

Bovine TB has affected both animal and human health for years. During the early part of the 20th century the disease affected more U.S. farm animals than did all other infectious diseases combined. The United States Department of Agriculture (USDA) Cooperative State-Federal Tuberculosis Eradication Program, which began in 1917, is chiefly responsible for the near-eradication of the disease from the nation's livestock population.

The only state with documented significant levels of Bovine TB in white-tailed deer is Michigan. This high rate of TB in Michigan is due to an artificially high density of deer in close association at winter food dumps provided for the deer herds. High deer densities most often occur when the amount of naturally available foods is supplemented, such as in urban or suburban environments or in cases such as Michigan.

Foot and Mouth Disease: There are no known cases of Foot and Mouth Disease in the United States. Foot and Mouth Disease is a highly contagious viral disease that affects domestic cattle, sheep, pigs, and goats. Deer are a known vector of this disease, and as such, USDA, APHIS, WS of Pennsylvania is a member of the Foot and Mouth Emergency Response Task Force.

The disease causes blisters which produces chronic lameness, weight loss, and decreased production, and can cause abortions and sterility. The incubation period for foot and mouth is 2 to 16 days. It is rarely fatal; however, it can cause severe economic losses from reduced production and the ability to export products (CDC 2003).

Chronic Wasting Disease: Chronic wasting disease (CWD) is a neurological disease found only in cervids (members of the deer family) in North America. The disease belongs to a family of diseases known as transmissible spongiform encephalopathies (TSE). The disease attacks the brain of infected animals and produces small lesions that result in death (PGC 2003). CWD has not been found in Pennsylvania. Efforts to prevent CWD from entering the state began in 2001 (PGC 2003). In January 2002, the state Agriculture Department banned importation of cervids from other states with known cases of CWD. In August 2002, the PGC enhanced the ban by closing the state's borders to all importation of any live cervids from any state or nation (PGC 2003). A multi-agency task force was formed to involve all agencies that would be involved in the event of a CWD outbreak. In 2001, the PGC worked with Penn State University veterinary

officials to test hunter-killed elk for CWD. For 2002, the agency continued to test hunter-killed elk, and expanded the monitoring program by testing a significant random sample of hunter-killed deer during the rifle deer season (PGC 2003). CWD has been identified in captive or wild deer or elk in Colorado, Wisconsin, Nebraska, Kansas, Montana, South Dakota, New Mexico, Utah, Illinois, and Oklahoma as well as in the Canadian province of Saskatchewan.

Pennsylvania WS submits a percentage of the deer killed for CWD testing. This testing could be expanded to testing for TB, Foot and Mouth Disease, and Hemorrhagic Fever at the request of the Pennsylvania Game Commission.

1.4.9 WS RECORD KEEPING REGARDING REQUESTS FOR DEER DAMAGE MANAGEMENT ASSISTANCE

WS maintains a Management Information System (MIS) database to document assistance that the agency provides in addressing wildlife damage conflicts. MIS data is limited to information that is collected from people who have requested services or information from Wildlife Services. It does not include requests received or responded to by local, State or other Federal agencies, and it is not a complete database for all wildlife damage occurrences. The number of requests for assistance does not necessarily reflect the extent of need for action, but this data does provide an indication that needs exists.

The database includes, but is not limited to, the following information: species of wildlife involved, the number of individuals involved in a damage situation; tools and methods used or recommended to alleviate the conflict; and the resource that is in need of protection. Table 1 provides a summary of Technical Assistance projects completed by the Pennsylvania WS program for Fiscal Years 1998-2002. A description of the WS Direct Control and Technical Assistance programs is contained in Chapter 3 of this EA.

Table 1-1*. Annual number of incidents for technical assistance involving white-tailed deer for Pennsylvania Wildlife Services during 1998-2002.

| Fiscal Year | Agriculture | Human Health and Safety | Property | Natural Resources | Total |
|--------------------|--------------------|--------------------------------|-----------------|--------------------------|--------------|
| 1998 | 0 | 0 | 0 | 0 | 0 |
| 1999 | 1 | 0 | 0 | 0 | 1 |
| 2000 | 0 | 0 | 0 | 1 | 1 |
| 2001 | 0 | 1 | 2 | 0 | 3 |
| 2002 | 0 | 1 | 1 | 0 | 2 |

**Data presented in this table were taken from PA WS Annual Program Reports and represent the number of technical assistance projects conducted by the PA WS program and do not include data from operational projects conducted during the time period covered

1.5 Operational Framework for Deer Damage Management in Pennsylvania

The potential for deer populations to exceed carrying capacity can negatively effect plant and animal species, conflict with land-use practices, and increase risk to human health and safety, any of which would necessitate effective deer damage management. Financial and logistical constraints require that deer management programs be practical and fiscally responsible.

1.5.1 Wildlife Services Objectives

- In consultation with the PGC, respond to requests for assistance with the appropriate action (technical assistance or direct control) as determined by Pennsylvania WS personnel, applying the ADC Decision Model (Slate et al. 1992).
- Hold the lethal take of nontarget animals by WS personnel during damage management to zero.

1.5.2 Relationship of this EA to Other Environmental Documents

WS conducted a NEPA process and developed a Final Environmental Impact Statement (FEIS) on the national APHIS/WS program (USDA 1997). The FEIS contains detailed discussions of potential environmental impacts from various wildlife damage management methods. Pertinent information available in the FEIS has been incorporated by reference into this EA. The FEIS may be obtained by contacting: USDA APHIS WS Operational Support Staff, 4700 River Rd., Unit 87, Riverdale, MD 20737-1234.

1.5.3 Decisions to be Made

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

- Should WS conduct white-tailed deer damage management in Pennsylvania to alleviate damage to agriculture, property, natural resources, and human health and safety?
- What mitigation measures should be implemented?
- Would the Preferred Alternative have significant impacts on the quality of the human environment requiring preparation of an EIS?

1.6 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.6.1 Actions Analyzed

This EA evaluates white-tailed deer damage management by WS to protect human health, human safety, property, natural resources and agriculture on private land or public facilities whenever or wherever such management is requested from the WS program in Pennsylvania.

1.6.2 American Indian Lands and Tribes

Currently WS does not have any MOUs or signed agreements with any American Indian tribe in Pennsylvania. If WS enters into an agreement with a tribe for white-tailed deer damage management, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA.

1.6.3 Period for which this EA is Valid

This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of WS state white-tailed deer damage management activities.

1.6.4 Site Specificity

This EA analyzes the potential impacts of white-tailed deer damage management and addresses 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 deer damage management on areas where additional agreements may be signed in the future. Because the Preferred Alternative 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. 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 federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc. Although some of the sites where deer damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever 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, APHIS-WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.6.5 Relationship to Other Environmental Documents

Increasing deer populations, improved technical knowledge, and dynamic social conditions have created a need for new environmental documents. This EA will replace

any other existing EA for deer management in Pennsylvania by PA WS, except for the EA that analyzes WS impacts of deer damage management activities at Fairmont Park (USDA 2001). WS will continue to implement program activities under the Fairmont Park EA and will include potential impacts of the EA (lethal deer take, impacts on nontarget species, etc.) in the cumulative analysis provide in this EA.

1.6.6 Public Involvement/Notification

As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.7 Authority and Compliance

1.7.1 Authority of Federal and State Agencies in White-tailed Deer Damage Management in Pennsylvania

See Chapter 1 of USDA (1997) for a complete discussion of federal laws pertaining to WS.

1.7.1.1 WS Legislative Authority

The USDA is authorized by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services program is the Act of 1931, as amended (7 U.S.C. 426-426c; 46 Stat. 1468), and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988, Public Law 100-102, Dec. 27, 1987. Stat. 1329-1331 (7 U.S.C. 426c), and the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act of 2001, Public Law 106-387, October 28, 2000. Stat. 1549 (Sec 767), which provides that:

The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001."

Since 1931, with the changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "*bringing (damage) under control*," rather than "*eradication*" and "*suppression*" of wildlife populations. In 1988, Congress strengthened the legislative authority of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with states, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammal and bird species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."

1.7.1.2 Pennsylvania Game Commission (PGC)

The Pennsylvania Game Commission is charged by law 322(a) Title 34 "to protect, propagate, manage, and preserve the game or wildlife of this Commonwealth and to enforce, by proper actions and proceedings, the law of this Commonwealth relating thereto."

The PGC has authority to manage deer in the Commonwealth of Pennsylvania under Game and Wildlife Code Title 34 and Title 58. Under Title 58, 147.321-147.329 and Title 34, Chapter 29, the PGC has the authority to permit the taking of deer to resolve damage problems covering this proposed action.

1.7.1.3 Pennsylvania Department of Agriculture (PDA)

The Pesticide Division of PDA enforces state laws pertaining to the use and application of pesticides. Under the Pennsylvania Pesticide Use and Application Act this section monitors the use of pesticides in a variety of pest management situations. It also licenses private and commercial pesticide applicators and pesticide contractors. Under the Pennsylvania Pesticide Control Act the division licenses restricted use pesticide dealers and registers all pesticides for sale and distribution in the commonwealth of Pennsylvania.

The PDA currently has a MOU with WS, which establishes a cooperative relationship between WS and the PDA, outlines responsibilities, and sets forth annual objectives and goals of each agency for resolving wildlife damage management conflicts in Pennsylvania.

1.7.2 Compliance with Other Federal Laws

Several other federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.7.2.1 National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in Pennsylvania. When WS direct management assistance is requested by another federal agency, NEPA compliance is the responsibility of the other federal agency. However, WS could agree to complete NEPA documentation at the request of the other federal agency.

1.7.2.2 Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)). WS obtained a Biological Opinion (B.O.) from the U.S. Fish and Wildlife Service (USDI 1992) describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F

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

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. 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. WS activities as described under the Preferred Alternative do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. WS has determined deer damage management actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in negative changes in the character or use of historic properties.

1.7.2.4 Environmental Justice and Executive Order 12898—“Federal Actions to Address Environmental Justice in Minority Populations and Low Income Population”

Executive Order 12898, entitled, “Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations” 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. It 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 minorities and persons or populations of low income. 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. It is not anticipated that the Preferred

Alternative would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income. Additionally, the donation of venison to charitable organizations would be a benefit to the economically disadvantaged, and to other persons in need.

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

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. 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 white-tailed deer damage management program would occur by using only 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.

1.7.2.6 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.

1.7.2.7 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.

1.7.2.8 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.

1.7.2.8 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. 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; the Western Wildlife Health Committee of the Western Association of Fish and Wildlife Agencies has recommended that suitable identification markers include durable ear tags, neck collars, or other external markers that provide unique identification (WWHC undated). APHIS-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 ENVIRONMENTS AND ISSUES

2.1 Affected Environments

The areas of the proposed action include, but are not limited to, property on or adjacent to airports, recreational areas, parks, corporate complexes, subdivisions, businesses, industrial parks, schools, agricultural areas, and cemeteries. The proposed action may be conducted on properties held in private, local, state or federal ownership.

2.1.1 Airports

Of all mammal species, deer are ranked as the most hazardous to aircraft, especially to smaller general aviation aircraft (Dolbeer et al. 2000), and they represent a serious threat to human health and safety. Airports are often secured areas with chain-link security fencing. Sometimes deer gain entrance into these airports where there is adequate cover and food, and they live there for all or part of the year. Because deer are ubiquitous throughout Pennsylvania, it is possible for deer to be present at nearly any airport in the state.

2.1.2 Properties where federal research laboratories are located

Federal property containing research facilities are usually controlled access areas with security fencing. These same properties often are unconcerned with the presence of deer until the herd is large enough to impact the horticulture present and the health of the herd itself. When herds of unhealthy sizes occur on federal properties, USDA WS is often called upon to reduce their sizes.

2.1.3 Urban and suburban and rural areas

Other areas include farms and rural areas where deer are causing damage to agriculture through feeding and antler rubbing and potentially to livestock through the spread of disease. Public and private properties in rural and urban/suburban areas may also be affected where deer cause damage to landscaping, to natural resources, by vehicle collisions, and through threats to human health and safety from disease transmission.

2.2 Issues Analyzed in Detail

The following issues have been identified as areas of concern requiring consideration in this environmental assessment:

2.2.1 Effects on White-tailed Deer Populations

There are concerns that the Preferred Alternative or any of the alternatives would result in the loss of local white-tailed deer populations or could have a cumulative adverse impact on statewide populations. Pennsylvania WS expects that no more than 1,000 deer would be lethally removed annually, under permits issued by the PGC, while conducting WS direct control activities within the state. However, in the event of a disease outbreak (Foot and Mouth or CWD) WS could take up to 10,000 (at the request of the PA Department of Agriculture and the PGC). Therefore, 10,000 deer was used to analyze WS potential impacts to the statewide deer population in Pennsylvania. Using the 2002-2003 hunter harvest (517,529), the number of deer killed under PGC issued crop and nuisance permits (5,022 in 2001), and the take of 10,000 deer by WS (in case of a disease

outbreak), the possibility of WS deer lethal take adversely affecting the overall Pennsylvania deer population (1.5 million) is considered extremely low (.06% of the overall populations and 1.9% of the total lethal take). The cumulative take appears to be far beneath the level that would begin to cause a decline in the PA deer population or to reduce the population by the PGC desired 2% over the next two years in PA (Brett Wallingford, PGC, personal communication).

2.2.2 Effects on Plants and other Wildlife Species, including 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 Preferred Alternative or any of the alternatives to inadvertently capture or remove nontarget animals or potentially cause adverse impacts to nontarget species populations, particularly T&E species. Special efforts are made to avoid jeopardizing Threatened and Endangered Species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of deer damage management control methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997). WS's standard operating procedures include measures intended to mitigate or reduce the effects on nontarget species populations and are described in other sections of this EA.

To reduce the risks of adverse affects to nontarget 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 effecting nontarget species.

Some people are concerned about the damaging effects that deer are having on native flora and fauna, and on the recovery of state and federally listed Endangered and Threatened species, and species of concern. These people are concerned as to whether the Preferred Alternative or any of the alternatives would reduce such damage to acceptable levels.

2.2.3 Effects on Human Health and Safety

A common concern is whether the Preferred Alternative 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 (i.e., trapping and sharp shooting) may be hazardous to people and pets. Another concern is that high deer populations pose a threat to human health and safety through the potential for deer-vehicle collisions, deer-aircraft collisions, and the spread of disease.

Firearm use is sensitive and a public concern because of safety issues relating to the public and firearms 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 within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). WS employees, who use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated

in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

2.2.4 Humaneness of methods to be used

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept. Kellert and Berry (1980) in a survey of American attitudes toward animals related that 58% of their respondents, "*... care more about the suffering of individual animals . . . than they do about species population levels.*" Schmidt (1989) indicated that vertebrate pest control 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 has been 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) 1986). Because suffering carries with it the implication of a time frame, a case could be made for "*... little or no suffering where death comes immediately . . .*" (California Department of Fish and Game 1991), such as the WS technique of shooting.

Defining pain as a component of humaneness may be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "*... probably be causes for pain in other animals . . .*" (AVMA 1986). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991). Some WS damage management methods such as traps and snares, may thus cause varying degrees of pain in different animal species for varying time frames. At what point pain diminishes or stops under these types of restraint has not been measured by the scientific community.

Pain and suffering as it relates to a review of WS damage management methods to capture animals, has both a professional and lay point of arbitration. Wildlife managers and the public would both be better served to recognize the complexity of defining suffering, since "*... neither medical or veterinary curricula explicitly address suffering or its relief*" (CDFG 1991).

Research suggests that with some methods, such as restraint in traps, changes in the blood chemistry of trapped animals indicate "*stress*" (USDA 1997: 3-81). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

Thus, the decision-making process involves tradeoffs between the above aspects of pain and humaneness. An objective analysis of this issue must consider not only the welfare of wild animals but also the welfare of humans if damage management methods were not used. Therefore, humaneness appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently.

The challenge in coping with this issue is how to achieve the least amount of suffering with the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management devices through research and is striving to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in those situations when non-lethal damage management methods are not practical or effective.

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. Standard Operating Procedures used to maximize humaneness are listed in this EA. As appropriate, WS euthanizes live animals by methods recommended by the AVMA (Beaver et al. 2001) 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.

2.2.5 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 Preferred Alternative 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 is truly subjective in nature, dependent on what an observer regards as beautiful.

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 to 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 benefiting from activities or contributions of animals such as their use

in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Pennsylvania WS recognizes that all wildlife has aesthetic value and benefit. WS only conducts deer damage management at the request of the affected home/property owner or resource manager. If WS received requests from an individual or official for deer damage management, 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 caring, humane, and professional manner.

2.2.6 Effects on Regulated White-tailed Deer Hunting

Some people may be concerned that deer removal activities conducted by WS would affect regulated deer hunting by significantly reducing local deer populations. WS deer removal activities would primarily be conducted on populations and in areas where hunting access is restricted or has been ineffective. In fact, lethal, management pressure applied to deer in these populations could serve to drive deer from these areas to places accessible to hunters. Further, the magnitude of the impact WS's activities will have on the deer population is considered low (see section 4.2, Alternative 5).

2.3 Issues not Considered in Detail With Rationale

2.3.1 WS' Impact on Biodiversity

No Pennsylvania WS deer damage management is, or will be, conducted to eradicate a native wildlife population. 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 (USDA 1997). WS operates on a small percentage of the land area of the Commonwealth, and the maximum WS take of any wildlife species analyzed in this EA is a small percentage (.06%) of the total population and is insignificant to the viability and health of the population.

2.3.2 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 commonwealth of Pennsylvania would meet the NEPA requirements for site specificity. If in fact a determination is made through this EA that the Preferred Alternative would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire commonwealth may provide a better analysis than multiple EA's covering smaller zones. In addition, Pennsylvania WS only conducts deer damage management in small areas of the Commonwealth where damage is occurring or likely to occur.

CHAPTER 3: ALTERNATIVES

3.1 Introduction

This chapter consists of 6 parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including Alternative 5 (the Preferred Alternative), 3) a description of Integrated Wildlife Damage Management, 4) deer damage management methods available for use or recommendation by WS in Pennsylvania, 5) alternatives considered but not in detail, with rationale, and 6) mitigation measures and standard operating procedures (SOPs) for deer damage management.

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), "*Methods of Control*" (USDA 1997, Appendix J), and the "*Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program*" (USDA 1997, P).

The five alternatives analyzed in detail are:

- Alternative 1 – No Deer Damage Management by WS
- Alternative 2 – Technical Assistance Only
- Alternative 3 – Lethal Deer Damage Management only by WS
- Alternative 4 – Non-lethal Deer Damage Management only by WS
- Alternative 5 – Integrated Deer Damage Management Program: No Action (Preferred Alternative)

3.2 Alternatives Considered, Including the Preferred Alternative

Alternative 1: No Deer Damage Management by WS

This alternative would eliminate WS involvement in all deer damage management activities. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own deer damage management without WS input.

Alternative 2: Technical Assistance Only

This alternative would only allow Pennsylvania WS to provide technical assistance to individuals or agencies requesting deer damage management. Individuals might choose to implement WS lethal and non-lethal recommendations, implement methods not recommended by WS, use contractual services of private businesses, or take no action. Appendix B describes methods available for recommendation by WS under this alternative.

Alternative 3: Lethal Deer Damage Management only by WS

Under this alternative, WS would provide only lethal direct control services and technical assistance. Requests for information regarding non-lethal management approaches would be referred to the Pennsylvania Game Commission, local animal control agencies, or private businesses or organizations. Individuals might choose to implement WS lethal recommendations, implement non-lethal methods or other methods not recommended by

WS, contract for WS lethal direct control services, use contractual services of private businesses, or take no action. Appendix B describes lethal methods available for recommendation and use by WS under this alternative.

Alternative 4: Nonlethal 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 Pennsylvania Game Commission, local animal control agencies, or private businesses or organizations. Persons incurring 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. Appendix B describes a number of non-lethal methods available for recommendation and use by WS under this alternative.

Alternative 5: Integrated Deer Damage Management Program: No Action (Preferred Alternative)

Under this alternative, Wildlife Services would continue the current damage management program that responds to requests for white-tailed deer damage assistance in the Commonwealth of Pennsylvania. An Integrated Wildlife Damage Management (IWDM) approach would be implemented in consultation and coordination with the Pennsylvania Game Commission to alleviate white-tailed deer damage to agriculture, property, natural resources, and human health and safety on all private and public lands of Pennsylvania where a need exists, a request 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, white-tailed deer, other species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods (see Appendix B) by applying the WS Decision Model (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 sharp shooting and live capture followed by euthanasia under permits issued by the Pennsylvania Game Commission. 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. Deer damage management would be conducted in the state, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed. All deer damage management would be consistent with other uses of the area and would comply with appropriate federal, state and local laws.

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 2, 3, 4, and 5 described above. Alternative 1 would terminate both WS technical assistance and operational deer damage management 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 (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective² manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment. IWDM may incorporate cultural practices (i.e., restricting flying times, no feeding policy), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

3.3.2 Technical Assistance Recommendations

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. Technical assistance is generally provided following an on-site visit or verbal consultation with the requester. WS personnel provide technical assistance such as information, instructional sessions, demonstrations and advice on available deer damage management techniques. Technical assistance includes demonstrations on the proper use of management devices (pyrotechnics, exclusion devices, etc.), wildlife 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 requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application. Technical assistance may require substantial effort by WS personnel in the decision making process, but the actual work is the responsibility of the requester.

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

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

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 problems, if the problem is complex.

3.3.4 Education

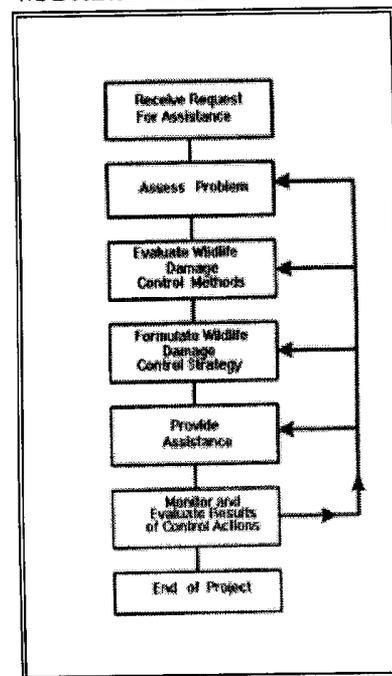
Education is an important element of WS's program activities because wildlife damage management is about finding "balance" or co-existence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine 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 WS Decision Making

The procedures used by WS personnel to determine management strategies or methods applied to specific damage problems can be found in USDA 1997, Appendix N.

WS personnel use a methodical 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 3-1). WS personnel are frequently contacted after requesters have tried or considered nonlethal methods and found them to be impractical, too costly, or inadequate for reducing damage to an acceptable level. WS personnel assess the problem and evaluate the appropriateness and availability (legal and administrative) of 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 conduct of effective wildlife damage management activities is necessary to relieve damage. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of

Figure 3-1
WS Decision Model



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.

3.3.6 Community-based Selection of a Deer Damage Management Program

Technical assistance provided by WS to resource owners for selection of a deer damage management 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 technical assistance regarding the biology and ecology of white-tailed 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.

Community selection of a deer damage management program: 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 times popularly 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 technical assistance to the local community or local business community authority(ies) 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.

Private property selection of a deer damage management program: When one person privately owns a parcel of property, the authority selecting the damage management plan would be him or herself. WS would provide technical assistance and recommendations to this person to reduce damage. If multiple property owners are affected and no homeowner or civic association represents the affected resource owners of the local community, then WS would provide technical assistance to the self or locally appointed authority(ies). Direct damage management would be provided by WS if requested,

funding was provided, and the requested direct damage management was consistent with WS recommendations, policy and federal and state laws. The affected resource owners would include those receiving damage and those whose property is adjacent to the areas where the deer primarily inhabit or damage resources. Affected resource owners who disagree with the direct damage management may request WS not conduct this action on their property and WS will honor this request; unless, as according to State law, the PGC has an animal health emergency and has requested WS involvement.

Public property selection of a deer damage management program: The authority selecting the damage management plan for local, state, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals and legal mandates for the property. WS would provide technical assistance and recommendations to this person to reduce damage. WS would provide direct damage management if it was requested, funding was provided, and the requested direct damage management was consistent with WS recommendations, policy, and federal and state laws.

Summary for community selection of a deer damage management program: This process for involving local communities and local stakeholders in the decisions for deer damage management assures that local concerns are considered before individual damage management actions are taken.

3.4 Wildlife Damage Management Methods Recommended or Authorized for Use

USDA (1997, Appendix J) describes methods currently used by the WS program. Several of these were considered in this assessment because of their potential use in reducing deer damage to agriculture, property, natural resources, and public health and safety. A listing and more detailed description of the methods used by Pennsylvania WS for deer damage management is found in Appendix B of this EA

3.4.1 Nonlethal Methods

Resource management: This method involves managing existing resources to discourage or eliminate the attractiveness of an area to deer or to minimize the likelihood that there will be conflict. Examples of this method include changes in human behavior (e.g., restructuring peak landing and takeoff times to avoid periods of high deer presence), habitat modification, livestock management, and modifying crop cultural practices (e.g., reducing vegetative cover, forage crops, or using less palatable landscape plants).

Physical exclusion: Fencing, netting, or other barriers can limit deer access to a particular area. There are several types of fences that can inhibit deer access including: temporary electric, high tensile electric, woven wire, chain-link, and solid wall fencing.

Behavior modification: The proper and integrated use of harassment techniques including auditory scaring techniques (pyrotechnics, propane exploders, electronic distress sounds, sirens, etc.) and visual scaring techniques (mylar ribbon, balloons, effigies, flashing lights, etc.) could help reduce conflicts.

Repellents: Repellents fall under two categories, contact repellants and area repellants. Contact repellents (Deer Away® and Miller's Hot Sauce®) are those repellents that are applied to vegetation to discourage deer from browsing. Area repellents (Hinder® and Ro-pel®) are designed to repel deer by odor alone.

3.4.2 Lethal Methods

Sharpshooting: This method requires selectively shooting deer from tree stands, vehicles, or vantage points. When possible, deer killed by WS are donated for processing and distribution to charitable food organizations.

Live-capture and euthanasia: In some areas sharpshooting may be inappropriate due to safety concerns. Capture methods for deer include: darting with capture drugs, clover traps, box traps, drop nets, and rocket nets. Captured deer would be euthanized by methods recommended by the AVMA (Beaver et al. 2001) or per the recommendations of a veterinarian.

Hunting programs: WS may recommend the use of state regulated firearm and archery deer hunting programs to reduce deer damage in a local area.

3.4.3 Examples of Past Deer Damage Management Projects Conducted by PA WS

Pennsylvania Wildlife Services has conducted deer damage management activities at sites that include but are not limited to airports, industrial facilities, National parks, and city parks.

3.5 Alternatives Considered But Not Analyzed in Detail With Rational

3.5.1 Live Trapping and Relocation

Under this alternative WS would capture deer alive using cage-type live traps or capture drugs administered by dart gun and then relocate the captured deer to another area. Numerous studies have shown that live-capture and relocation of deer is relatively expensive, time-consuming and inefficient (Ishmael and Rongstad 1984, O'Bryan and McCullough 1985, Diehl 1988, Jones and Witham 1990, Ishmael et al. 1995). Population reduction achieved through capture and relocation is labor intensive and would be costly (\$273-\$2,876/deer) (O'Bryan and McCullough 1985, Bryant and Ishmael 1991). Additionally, relocation frequently results in high mortality rates for deer (Cromwell et. al. 1999, O'Bryan and McCullough 1985, Jones and Witham 1990, Ishmael et. al. 1995). Deer frequently experience physiological trauma during capture and transportation, (capture myopathy) and deer mortality after relocation, from a wide range of causes within the first year, has ranged from 25-89% (Jones and Witham 1990, Mayer et al. 1993). O'Bryan and McCullough (1985) found that only 15% of radio-collared black-tailed deer that were live-captured and relocated from Angel Island, California, survived for one year after relocation. Although relocated deer usually do not return to their location of capture, some do settle in familiar suburban habitats and create nuisance problems for those communities (Bryant and Ishmael 1991). High mortality rates of relocated deer, combined with the manner in which many of these animals die, make it difficult to justify relocation as a humane alternative to lethal removal methods (Bryant

and Ishmael 1991). Chemical Capture methods require specialized training and skill. A primary limitation of darting, the limited range at which deer can be effectively hit, is generally less than 40 yards. With modern scoped rifles, however, a skilled sharpshooter can hit the head or neck of a deer for a quick kill out to 200 yards and beyond (although a shot over 200 yards is not very likely). Thus, chemical capture is far less efficient, more labor intensive, and much more costly than lethal removal with rifles.

Translocation of wildlife is discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, potential for disease transfer and difficulties in adapting to new locations or habitats. Also many states no longer permit the interstate transfer of deer due to recent concerns of chronic wasting disease outbreaks (section 1.3.6, page 9). If CWD is already present in Pennsylvania, relocating deer within the state could serve to vector the disease.

3.5.2 Population stabilization through birth control

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

Reproductive control for wildlife could be accomplished either through sterilization (permanent) or contraception (reversible, initial treatment usually followed by a booster and annual follow-up treatments). Sterilization could be accomplished through: 1. Surgical sterilization (vasectomy, castration, and tubal ligation), 2. Chemosterilization, and 3. Gene therapy. Contraception could be accomplished through: 1. Hormone implantation (synthetic steroids such as progestins), 2. Immunocontraception (contraceptive vaccines), and 3. Oral contraception (progestin administered daily). Research into the use of these techniques would consist of laboratory/pen experimentation to determine and develop the sterilization or contraceptive material or procedure, field trials to develop the delivery system, and field experimentation to determine the effectiveness of the technique in achieving population reduction.

The use of hormones was investigated (Matschke 1976, 1977 a, b, c, 1980, and Roughton 1979), and eventually rejected as an effective and efficient reproductive control technique for deer. Additionally, concerns related to costs and logistics of widespread distribution of drugged baits, dosage control and ingestion of baits by children and nontarget animals make oral contraception (by steroids) largely impractical (Lowery et al. 1993). More recently, Immunocontraception has been studied in various situations and locations, but

its potential use appears limited due to considerable constraints regarding treatment and follow-up treatment of a sufficiently large number of target animals, varying immunogenicity of vaccines, genetic backgrounds of individual animals, age, nutritional status, stress and other factors (Becker et al. 1997, Becker et al. 1999). The use of porcine zona pellucida (PZP) as a contraceptive agent in wildlife management has been investigated recently (Kirkpatrick et al. 1990, Turner and Kirkpatrick 1991, Turner et al. 1992, and Turner et al. 1996), but to date, there is no published documentation that immunocontraceptive vaccines have successfully reduced any free-ranging white-tailed deer herd or population.

Turner et al. (1993) noted that although contraception in white-tailed deer may be used to limit population growth, it will not reduce the number of deer in excess of the desired level in many circumstances. They further contend that initial population reductions by various other means may be necessary to achieve management goals, and that reproduction control would be one facet of an integrated program. In sum, although immunocontraceptive technology has been variously effective in laboratories, pens, and in island field applications, it has not been effective in reducing populations of free-ranging white-tailed deer.

The use of this method would be subject to approval by Federal and State Agencies. This alternative was not considered in detail because:

- it would take a number of years of implementation before the deer population would decline and therefore, damage would continue at the present unacceptable levels for a number of years;
- surgical sterilization would have to be conducted by licensed veterinarians, and would therefore be extremely expensive;
- it is difficult, time-consuming, and expensive to effectively live trap, chemically capture, or remotely treat the number of deer necessary to effect an eventual decline in the population; and
- State and Federal regulatory authorities have approved no chemical or biological agent for use as a deer contraceptive.

3.6 Mitigation and Standard Operating Procedures for Wildlife Damage Management Techniques

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in Pennsylvania, uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1997). Some key mitigating measures pertinent to the Preferred Alternative and alternatives that are incorporated into WS's Standard Operating Procedures are listed in the following table.

| MITIGATION MEASURES | WS ALTERNATIVES | | | | |
|--|-----------------|-------------|--------|-----------|-----------------------------|
| | No Involvement | Tech. Asst. | Lethal | Nonlethal | IWDM: No Action (Preferred) |
| Animal Welfare and Humaneness of Methods Used by WS | | | | | |
| Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate. | | | X | X | X |
| The Decision Model (Slate et al. 1992) is used to identify effective biological and ecologically sound deer damage management strategies and their impacts. | | | X | X | X |
| Euthanasia procedures approved by the AVMA that cause minimal pain are used for live animals. | | | X | | X |
| The use of newly developed, proven nonlethal methods would be encouraged when appropriate. | | | | X | X |
| Drugs are used according to the Drug Enforcement Agency, FDA, and WS program policies and directives and procedures are followed that minimizes pain. | | | X | X | X |
| Safety Concerns Regarding WS Damage Management Methods | | | | | |
| The Decision Model (Slate et al. 1992), designed to identify the most appropriate damage management strategies and their impacts, is used to determine deer damage management strategies. | | | X | X | X |
| All controlled substances are registered with DEA or FDA. | | | X | X | X |
| WS employees would follow approved procedures outlined in the WS Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (Johnson et al. 2001). | | | X | X | X |
| WS employees that use controlled substances are trained to use each material and are certified to use controlled substances under Agency certification program. | | | X | X | X |
| WS employees who use controlled substances participate in State approved continuing education to keep abreast of developments and maintain their certifications. | | | X | X | X |
| Controlled substance use, storage, and disposal conform to label instruction and other applicable laws and regulations, and Executive Order 12898. | | | X | X | X |
| Material Safety Data Sheets for controlled substances are provided to all WS personnel involved with specific WDM activities. | | | X | X | X |
| Concerns about Impacts of Damage Management on Target Species, T&E Species, Species of Special Concern, and Non-target Species | | | | | |
| WS consulted with the USFWS and the PGC regarding the nation-wide program and would continue to implement all applicable measures identified by the USFWS and the PGC to ensure protection of T&E species. | | | X | X | X |
| Management actions would be directed toward localized populations or groups and/or individual offending animals. | | | X | X | X |
| WS personnel are trained and experienced to select the most appropriate methods for taking targeted animals and excluding non-target species. | | | X | X | X |
| WS would initiate informal consultation with the USFWS following any incidental take of T&E species. | | | X | X | X |

WS take is monitored by number of animals by species with overall populations or trends in population to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (See Chapter 4).

| | | | | |
|--|--|---|--|---|
| | | X | | X |
|--|--|---|--|---|

CHAPTER 4: CONSEQUENCES OF THE DEER DAMAGE MANAGEMENT PROGRAM

This chapter provides information for making informed decisions on the deer damage management program outlined in Chapter 1, the issues and affected environments discussed in Chapter 2, and on cumulative impacts.

Impacts from this management plan may be unforeseen, cumulative, or unavoidable. Such effects are discussed in relationship to each of the wildlife species and the resulting environmental impacts are analyzed in this chapter. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. Analysis of the Pennsylvania WS "takes" during past management activities and anticipated future activities, in combination with other mortality, indicates that cumulative impacts are not adversely affecting the viability and health of populations. It is not anticipated that the WS program would result in any adverse cumulative impacts to T&E species, and deer damage management activities do not jeopardize public health and safety.

4.1 Analysis of Social Consequences and Resource Use

This section analyzes the environmental consequences using Alternative 5 as the No Action alternative and therefore will be used as the baseline when comparing the other alternatives to determine if the real or potential impacts are greater, lesser or the same (Table 4-2). 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).

4.1.1 Social and Recreational Concerns

These concerns are discussed throughout the document as they relate to issues raised during public involvement, and they are discussed in USDA (1997).

4.1.2 Irreversible and Irretrievable Commitments of Resources

The following resource values within Pennsylvania would not be adversely impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. Based on these estimates, the Pennsylvania WS program produces very negligible impacts on the supply of fossil fuels and electrical energy.

4.2 Alternatives Analyzed in Detail by Potential Impacts

Six key potential impacts of this program have been identified, and each of these impacts is discussed for each alternative. The six impacts include: effects on white-tailed deer populations; effects on plants and other wildlife species, including T & E species; effects

on human health and safety; humaneness of methods to be used; effects of aesthetic values, and effects on regulated white-tailed deer hunting.

Alternative 1: No Deer Damage Management by WS

Effects on white-tailed deer populations: WS would conduct no deer damage management activities under this alternative. Local deer populations could decline, stay the same, or increase depending on actions taken by others. Some resource/property owners may kill deer, or allow other hunters access to hunt deer, during the hunting season. Resource/property owners may also obtain special permits from the PGC to allow them to shoot deer outside of the hunting season and in those areas where sport 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 would temporarily decline or stabilize where hunting pressure and permitted removal activities were adequate. Some resource/property 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 Preferred Alternative.

Effects on plants and other wildlife species, including T & E species: In the absence of a WS deer damage management program some resource/property owners with little or no shooting experience may attempt to remove deer. These resource/property owners could be more likely than WS personnel to take a non-target species and not report non-target take.

Damage caused by deer to wildlife species, including T&E species, may continue or increase in those situations where the resource/property owner does not implement their own deer damage management program or in those situations where a resource/property owner does not have the resources or abilities to implement an effective deer damage management program.

Effects on human health and safety: Potential threats to human health and safety may continue or increase in those situations where the resource/property owner does not implement their own deer damage management program; or in those situations where a resource/property owner does not have the resources or abilities to implement an effective deer damage management program.

Inexperienced resource/property owners may attempt to solve deer damage problems through trapping and shooting. Therefore, there could be increased risks to human health and safety from improper or inexperienced use of damage management methods.

Humaneness of methods to be used: Many people would consider this alternative humane because WS would not be involved in management actions. However, resource/property owners could use lethal and non-lethal methods to reduce deer damage. Some resource/property owners may take illegal action against localized populations of deer out of frustration of continued damage. These illegal actions may be less humane than

methods used by experienced WS personnel. The humaneness of actions implemented by non-WS would be variable dependent upon the person implementing the action.

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/property 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 they believe it is morally wrong to kill or use animals for any reason. 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 deer damage management activities resulting in impacts similar to Alternative 5.

Effects on regulated white-tailed deer hunting: WS would have no impact on regulated deer hunting. However, resource/property owners may remove deer under special permits issued by the PGC resulting in impacts similar to the Preferred Alternative.

Alternative 2: Technical Assistance Only

Effects on white-tailed deer populations: No direct deer damage management activities would be conducted by WS under this alternative. Local deer populations could decline, stay the same, or increase depending on actions taken by others. Some resource/property owners may kill deer, or allow other hunters access to hunt deer, during the hunting season. Resource/property owners may obtain special permits from the PGC to allow them to shoot deer outside of the hunting season and in those areas where sport 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 would temporarily decline or stabilize where hunting pressure and permitted removal activities were adequate. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of deer out of frustration or ignorance, but would likely occur at a lower rate than Alternative 1 if WS advice is obtained and implemented. While WS would provide technical assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the preferred alternative.

Effects on plants and other wildlife species, including T & E species: In the absence of an integrated deer damage management program some resource/property owners with little or no shooting experience may attempt to remove deer. These resource owners would be more likely than WS personnel to take a non-target species and not report non-target take, but would likely occur at a lower rate than Alternative 1 if WS advice is obtained and implemented.

Damage caused by deer to wildlife species, including T&E species, may continue or increase in those situations where the resource owner/property owner does not implement their own deer damage management program, does not have the resources or abilities to implement an effective deer damage management program, or does not seek and implement WS technical advise.

Effects on human health and safety: Potential threats to human health and safety may continue or increase in those situations where the resource/property owner does not implement their own deer damage management program; or in those situations where a resource/property owner does not have the resources or abilities to implement an effective deer damage management program. This increased threat would likely be less than Alternative 1 when WS recommendations are obtained and implemented.

Inexperienced resource/property owners may attempt to solve deer damage problems through trapping and shooting. Therefore, there could be increased risks to human health and safety from improper or inexperienced use of damage management methods. This increased risk would likely be less than Alternative 1 when WS recommendations are obtained and implemented.

Humaneness of methods to be used: Many people would consider this alternative humane because WS would not directly implement any deer control measures. Resource/property owners could use lethal and non-lethal methods recommended by WS to reduce deer damage or implement their own control methods without WS assistance. Some resource/property owners may take illegal action against localized populations of deer out of frustration of continued damage. Some of these illegal actions may be less humane than methods used by experienced WS personnel. The humaneness of actions implemented by non-WS would be variable dependent upon the person implementing the action.

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/property 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 they believe it is morally wrong to kill or use animals for any reason. Some people would support this alternative because they enjoy seeing deer, or having deer nearby. However, while WS would take no direct action under this alternative, other individuals or entities could, and likely would, conduct deer damage management activities resulting in impacts similar to Alternative 5.

Effects on regulated white-tailed deer hunting: WS would have no direct impact on regulated deer hunting. However, resource/property owners may remove deer under special permits issued by the PGC resulting in impacts similar to the preferred alternative.

Alternative 3: Lethal Deer Damage Management Only by WS

Effects on white-tailed deer populations: This alternative could result in a decrease in the deer population at the specific site where the damage management occurs. It is not anticipated that WS would kill more than 1,000 deer annually, on standard projects and in the event of a disease outbreak (Foot and Mouth or CWD) WS could take up to 10,000 (at the request of the PA Department of Agriculture and the PGC). Therefore, the impacts on deer populations are expected to be similar to those described in the Preferred Alternative. New deer would likely re-inhabit the site as long as suitable habitat exists.

The amount of time until new deer move into the area would vary depending on the habitat type, time of year, and population densities in the area.

Effects on plants and other wildlife species, including T & E species: WS impacts would be similar to those described in the preferred alternative, except in situations where lethal methods could not be used or are ineffective at reducing damage to acceptable levels. In these situations the impacts from this alternative would be similar to alternative 1.

Effects on human health and safety: The potential risks to human safety from use of lethal methods by WS would be similar to the Preferred Alternative. WS follows all firearm safety precautions when conducting damage management and complies with all laws and regulations governing the lawful use of firearms.

The reduction of deer induced human health and safety threats would be similar to those described under the Preferred Alternative, except in those situations where lethal methods could not be used or are ineffective at reducing damage to acceptable levels. In those situations impacts would be similar to alternative 1.

Humaneness of methods to be used: WS personnel are experienced and professional in their use of management methods. Methods are applied as humanely as possible. Under this alternative, deer would be killed as humanely as possible by experienced WS personnel using the most appropriate method available. Some individuals could perceive these methods as inhumane because they oppose all lethal methods of damage management. Overall impacts would be similar to the Preferred Alternative.

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. This alternative would likely be favored by resource owners who are receiving damage when lethal actions effectively reduces damage to acceptable levels, although, some resource owners would be saddened if the deer were removed. Some individuals would strongly oppose this alternative because they believe it is morally wrong to kill or use animals for any reason or they believe the benefits from deer would outweigh the associated damage. The ability to view and aesthetically enjoy deer at a particular site could be limited if the deer are removed. The opportunity to view deer is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

Effects on regulated white-tailed deer hunting: Shooting of deer by WS employees would only occur after a permit has been issued by the PGC to remove deer that are causing damage or in those situations where deer are a potential human health and safety threat or are a threat of spreading diseases. This activity would result in reduced deer densities on project areas and may reduce densities in some project area deer management zones, 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 minimal due to:

- A. the number of deer expected to be killed by WS is minimal (.06%) when compared to the number taken by hunters in the zone(s) and

- B. the number of deer expected to be killed by WS would not cause a statewide deer population reduction.

There may be some cases, where landowners have not permitted regulated deer hunting, but would allow WS employees to shoot deer. This would have only a minimal impact on deer hunting, since the land was not previously accessible to hunters. Overall impacts would be similar to the Preferred Alternative.

Alternative 4: Non-lethal Deer Damage Management Only by WS

Effects on white-tailed deer populations: WS would kill no deer under this alternative. Local deer populations could decline, stay the same, or increase depending on actions taken by others. Some resource/landowners owners may kill deer, or allow other hunters access to kill deer, during the legal hunting season. Resource/landowners owners may obtain special permits from the PGC to shoot deer outside of the hunting season and in those areas where sport 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 would temporarily decline or stabilize where hunting and permitted removal activities were adequate. Some resource/landowners owners may take illegal, unsafe, or environmentally harmful action against local populations of deer out of frustration or ignorance. 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 Preferred Alternative.

Effects on plants and other wildlife species, including T & E species: In the absence of an integrated deer damage management program by WS that includes the option of lethal removal of deer from damage sites, some resource/landowners owners with little or no shooting experience may attempt to remove deer. These inexperienced resource/landowners owners would be more likely than WS personnel to take a non-target species and not report non-target take. WS take of nontarget species is expected to be minimal or nonexistent. The effects of WS use of non-lethal methods would be similar to those described under the Preferred Alternative.

WS impacts would be similar to those described in the preferred alternative, where nonlethal methods are effective at reducing damage to acceptable levels. When nonlethal methods are ineffective at reduce damage to acceptable levels and resource/landowners owners do not implement their own lethal control methods, damage caused by deer to wildlife species, including T&E species, may increase in those situations. In these situations impacts would be similar to alternative 1.

Effects on human health and safety: Concerns regarding WS use of lethal methods would be alleviated under this alternative. However, non-WS personnel would likely conduct lethal control actions that would not be available by WS resulting in impacts similar to alternative 1.

Non-lethal methods would not be efficient or successful in resolving many deer damage situations. There are potential for increased threats to public health and safety when

nonlethal methods are ineffective and non-WS personnel do not effectively reduce local deer herds. Resource/landowners owners may attempt to lethally resolve deer damage problems through illegal use of chemicals/pesticides, trapping, and shooting. In these situations there may be some risk to human health and safety from improper or inexperienced use of these methods. The reduction of deer induced human health and safety threats would be similar to those described under the Preferred Alternative in those situations where nonlethal methods are effective at reducing damage to acceptable levels. In those situations where nonlethal methods are ineffective impacts would be similar to alternative 1.

Humaneness of methods to be used: WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Some individuals may perceive this approach as humane because they oppose all lethal methods of damage management. However, without effective damage management methods available, resource/landowners owners may take illegal action against some local populations of deer out of frustration of continued damage. Some of these illegal actions may be less humane than methods used by WS personnel. While WS could only provide non-lethal assistance under this alternative, other individuals or entities could conduct lethal damage management with impacts similar to alternative 1.

Effects on aesthetic values: The impacts of this alternative to stakeholders would be variable depending on the damage management efforts employed by resource/landowners owners, their values toward deer and compassion for their neighbors. Resource/landowners owners who are receiving damage from deer would likely oppose this management alternative when nonlethal methods are ineffective. Some people would support this alternative because they believe resource owners would do little to remove deer. Others would oppose this alternative because they believe resource/landowners owners would use illegal, inhumane, or environmentally unsafe methods. 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 Alternative 5.

Effects on regulated white-tailed deer hunting: WS would have no impact on regulated deer hunting since WS would not lethally remove deer under this alternative. However, resource/landowners owners may remove deer under special permits issued by the PGC resulting in impacts similar to the Preferred Alternative.

Alternative 5: Integrated Deer Damage Management Program: No Action (Preferred Alternative)

Effects on white-tailed deer populations: From FY 1998 – FY 2002 WS lethally removed 46, 53, 61, 505, and 575 respectively, while conducting deer damage management activities in Pennsylvania. Based upon an anticipated increase in requests for assistance, the Pennsylvania WS program expects that no more than 1,000 deer would be lethally removed annually, under permits issued by the PGC, while conducting WS direct control activities within the state. However, in the event of a disease outbreak (Foot and Mouth or CWD) WS could take up to 10,000 deer (at the request of the PA Department of

Agriculture and the PGC). Therefore, 10,000 deer was used to analyze WS potential impacts to the statewide deer population in Pennsylvania.

The authority for management of resident wildlife species is the responsibility of the PGC, and deer are classified as protected big game. The PGC collects and compiles information on white-tailed deer population trends and take, and uses this information to manage deer populations. This information has been provided to WS to assist in the analysis of potential impacts of WS activities on the deer herd in Pennsylvania.

Currently, the PGC estimates that there are about 1.5 million deer in Pennsylvania (Brett Wallingford, PGC, personal communication). The PA deer population is estimated from population modeling, harvest trend analysis, and monitoring vital statistics of the deer herd (Brett Wallingford, PGC, personal communication).

Using the 2002-2003 hunter harvest (517,529), the number of deer killed under PGC issued crop and nuisance permits (5,022 in 2001) and the take of 10,000 deer by WS (in case of a disease outbreak), the possibility of WS deer take affecting the overall Pennsylvania deer population (1.5 million) is considered extremely low. The cumulative take (.06% of the overall population and 1.9% of the total lethal take) would be far beneath the level that would begin to cause a decline in the PA deer population or to reduce the population by the PGC desired 2% over the next two years in PA (Brett Wallingford, PGC, personal communication).

Effects on plants and other wildlife species, including T & E species: WS personnel are trained and experienced to select the most appropriate tools and methods for taking target animals and excluding nontargets. WS take of nontarget species is expected to be minimal or nonexistent. Other wildlife populations would not be negatively affected, except for the occasional scaring effect from the sound of gunshots. In these cases, birds and other mammals may temporarily leave the immediate vicinity of shooting, but would most likely return after conclusion of the action. To date, no nontarget animals have been killed by WS conducting deer damage management activities in Pennsylvania.

The USFWS and the PGC have provided WS a list of Endangered, Threatened and Special Concern species in Pennsylvania. WS will periodically consult with the USFWS and PGA to ensure that actions taken under this plan will not adversely affect PA listed species. WS could benefit listed species by reducing deer browsing damage to listed plant species and to habitats of listed animal species.

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the ESA concerning potential impacts of wildlife damage management methods on T&E species and has obtained a Biological Opinion (USDI 1992). For the full context of the Biological Opinion, see Appendix F of the ADC Final EIS (USDA 1997, Appendix F). Based on the conclusions made by USFWS during their 1992 programmatic consultation of WSs activities and subsequent Biological Opinion, it was determined that management activities being utilized for deer damage management in Pennsylvania are

not likely to adversely affect the T&E species listed in Pennsylvania. Furthermore, the Pennsylvania WS program has determined no effect on those T&E species considered extirpated from the state; and those T&E species (Bog turtle (*Clemmys muhlenbergii*), Clubshell mussel (*Pleurobema clava*), Dwarf wedgemussel (*Alasmidonta heterodon*), Northern riffleshell (*Epioblasma torulosa rangiana*), and Northeastern bulrush (*Scirpus ancistrochaetus*)) and methods not included in the 1992 B.O.

This alternative would reduce the damaging effects that deer are having on native flora and fauna, including the recovery of threatened and endangered species to acceptable levels.

Effects on human health and safety: WS's methods of shooting and trapping pose minimal or no threat to human health and safety. A formal risk assessment of WS' operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse affects on human safety from WS' use of these methods is expected.

WS follows firearm safety precautions when conducting damage management and WS complies with all laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles is used to reduce deer damage when lethal methods are determined to be appropriate. WS could use firearms to 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.

The use of firearms can be a politically sensitive issue because of the occasional carelessness and misuse of firearms by people. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety-and-use training program within three months of their appointment and a refresher course every two years afterwards (WS Directive 2.615). WS employees, who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment*.

This alternative would have the greatest potential to reduce threats to public health and safety from a site by alleviating potential threats of transmitting diseases, and potential deer/aircraft and deer/vehicle collisions since all available lethal and nonlethal methods could be considered for use or recommended.

Humaneness of methods to be used: WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Under this alternative, deer would be shot or trapped as humanely as possible by experienced WS personnel using the best method available. Deer live-captured in traps would be euthanized. Some individuals may not perceive this method as humane because they oppose all lethal methods of damage management. However, this alternative allows WS to consider non-lethal methods, and WS would implement non-lethal methods for deer damage management when appropriate.

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. Most resource owners who are incurring damage would likely favor this alternative as it allows for an IWDM approach to resolving damage problems. The proposed IWDM approach allows for the use of the most appropriate damage management methods. Most stakeholders without damage would also prefer this alternative to Alternative 3, where all deer are killed, because non-lethal methods could be appropriate to resolve damage problems in some situations. Some individuals would strongly oppose this alternative, and most action alternatives, because they believe it is morally wrong to kill or use animals for any reason or they believe that the benefits from deer outweigh the associated damage.

The ability to view and aesthetically enjoy deer at a particular site could be limited if the deer are removed. New deer, however, would likely use the site in the future, although the length of time until new animals arrive is variable, depending on the habitat, time of year, and population densities in the area. The opportunity to view deer is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

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. An IWDM approach, which includes non-lethal and lethal methods, 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 want WS to teach tolerance for deer damage and threats to public health or safety, and that deer should never be killed.

Effects on regulated white-tailed deer hunting: Shooting of deer by WS personnel would only occur after a permit has been issued by the PGC to remove deer that are causing damage or in those situations where deer are a potential human health and safety threat or are a threat of spreading diseases. This activity would result in reduced deer densities on project areas and may reduce densities in some project area deer management zones, hence slightly reducing the number of deer that may otherwise be available to hunters during hunting seasons. The impact of this activity, however, is expected to be minimal due to:

- A. the number of deer expected to be killed by WS is minimal when compared to the number taken by hunters in the zone(s) and

B. the number of deer expected to be killed by WS would not cause a statewide reduction in deer populations.

There may be some cases, where landowners have not permitted regulated deer hunting, but would allow WS employees to shoot deer. This would have a minimal impact on deer hunting, since the land was not previously accessible to hunters.

4.3 Cumulative Impacts

No significant cumulative environmental impacts are expected from any of the 5 alternatives. Under the Preferred Alternative and Alternative 3, the lethal removal of deer would not have a significant impact on overall deer populations in Pennsylvania, but some local reductions may occur. This is supported by the PGC, which is the agency with responsibility for managing wildlife in the Commonwealth. No risk to public safety is expected when WS' services are provided and accepted by requesting individuals in Alternatives 2, 3, 4, and 5 since only trained and experienced wildlife biologists would conduct and recommend deer damage management activities. There is a slight increased risk to public safety when a person rejects WS assistance and recommendations in Alternatives 2, 3, 4, and 5. Although some persons will likely be opposed to WS' participation in deer damage management 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.

Table 4-1 Comparisons of Issues/Impacts and Alternatives

| <i>Issues/Impacts</i> | <i>Alternative 1</i> | <i>Alternative 2</i> | <i>Alternative 3</i> | <i>Alternative 4</i> | <i>Alternative 5</i> |
|--|---|---|--|---|---|
| Effects on white-tailed deer populations | WS would not affect population. If resource owner conducts deer management, effect would be similar to Alternative 5. | WS would not affect population. If resource owner conducts deer management, effect would be similar to Alternative 5. | Local population would be reduced and sustained at a lower level. No effect on statewide deer population. | WS would not affect population. If resource owner conducts deer management, effect would be similar to Alternative 5. | Local population would be reduced and sustained at a lower level. No effect on statewide deer population. |
| Effects on plants and other wildlife species, including T&E species | No impact by WS. Positive impact to those species that are being negatively impacted by deer if resource owner implements damage reduction program. | No impact by WS. Positive impact to those species that are being negatively impacted by deer if resource owner implements damage reduction program. | No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer if lethal methods are effective. | No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer if nonlethal methods are effective. | No adverse impacts by WS. Positive impact to those species that are being negatively impacted by deer. |
| Effects on human health and safety | No impact by WS. If resource owners conduct deer damage management, effect would be variable. | No impact by WS. If resource owners conduct deer damage management, effect would be variable. | No adverse impact by WS. Slight positive effect from reduced deer strikes and disease transmission if lethal methods are effective. | No adverse impact by WS. Slight positive effect from reduced deer strikes and disease transmission if nonlethal methods are effective. | No adverse impact by WS. Positive effect from reduced deer strikes and disease transmission. |
| Humaneness of methods to be used | Most would view as humane. If resource owners conduct deer management activities, effects would be variable. | Most would view as humane. If resource owners conduct deer management activities, effects would be variable. | Effects would be variable. Some would view as inhumane. | Most would view as humane. If resource owners conduct lethal deer management activities, effects would be variable. | Effects would be variable. Some would view as inhumane. |

| <i>Issues/Impacts</i> | <i>Alternative 1</i> | <i>Alternative 2</i> | <i>Alternative 3</i> | <i>Alternative 4</i> | <i>Alternative 5</i> |
|---|--|--|---|---|---|
| Effects on aesthetic values | Population would remain the same or increase. Increased opportunity to view deer. If resource owner conducts deer damage management activities, effects would be similar to Alternative 5. | Population would remain the same or increase. Increased opportunity to view deer. If resource owner conducts deer damage management activities, effects would be similar to Alternative 5. | Local population would be reduced, less opportunity to view deer at damage site. Possible reduction in damage if WS lethal actions effective. | WS would not affect population. Possible reduction in damage if WS nonlethal actions effective. If resource owners conduct lethal deer damage management activities effect would be similar to Alternative 5. | Local population would be reduced, less opportunity to view deer at damage site. Damage would be reduced. |
| Effects on regulated white-tailed deer hunting | No effect by WS. Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons if resource owner implements lethal control methods. | No effect by WS. Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons if resource owner implements lethal control methods. | Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons | No effect by WS. Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons if resource owner implements lethal control methods. | Slight reduction in the number of deer that may otherwise be available to hunters during hunting seasons |

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Appendix A

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Appendix B

WHITE-TAILED DEER DAMAGE MANAGEMENT METHODS RECOMMENDED OR AUTHORIZED FOR USE BY THE PENNSYLVANIA WILDLIFE SERVICES PROGRAM

NONLETHAL METHODS

Resource Management

These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Resource owner/manager implements cultural methods and other management techniques. 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:

Changes in human behavior: These may include altering the flight times of departures and arrivals times so that flying is at a time period of low wildlife activity. Restricting flying during certain times of the day or restricting departures and arrivals on specific runways.

Habitat modification: Environmental/Habitat Modification can be an integral part of WDM. 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 resource/property owner is responsible for implementing habitat modifications, and 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 WDM 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.

Livestock management: Modifying or eliminating habitat utilized by deer may change deer behavior and reduce some deer-human conflicts. This could include reducing vegetative cover and forage plants used or preferred by deer. One method, to eliminate habitat, is using cattle to consume the biomass that deer and other wildlife would feed upon. Reardon and Merrill report that continuous heavy grazing by cattle or by mixed classes of livestock eliminated preferred deer foods and adversely impacts other aspects of white-tailed deer habitat. (Reardon and Merrill 1976, Merrill et al. 1957, Merrill 1959) Crawford noted that livestock grazing affects the vigor and composition of plants and the direction and rapidity of plant succession. Thus, it can significantly influence carrying capacity of white-tailed deer habit (Crawford 1984).

Cultural practices: Studies in agriculture areas of Missouri indicate cultivated crops comprised 41 percent of deer diet by volume. (Beringer J. and Hansen L. P. 1997). Thus, by reducing the amount of crops adjacent to the airports runways, deer densities next to

these areas may decrease. For example, brome grass could be chosen to replace row crops, as brome is not a highly preferred plant species by deer, relative to other row crops, alfalfa and clover and still provides the owner with a source of revenue.

Physical Exclusion

A fence can limit the entry of deer onto affected properties. There are several types of fences that inhibit the movement of deer if properly installed, including electric fencing, woven wire, and chain link fencing. The height of a fence required to exclude deer is a much debated topic. Smith and Coggin (1984) reported that a 7-foot fence (2.1-meters) reduced deer-vehicle collisions by 44.3 to 83.9 percent along a New York Thruway. Clearly and Dolbeer (1999) recommend that airports install a 10-foot chain link fence with barbed-wire outriggers to limit deer entry. 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.

Behavior Modification

This refers to tactics that alter the behavior of wildlife to reduce damage. Effective behavior modification usually requires integrating two or more auditory scaring or visual scaring techniques.

Auditory scaring techniques

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

Pyrotechnics: Pyrotechnics are specialized fireworks that are shot out of a 12-gauge shotgun or starter's pistol to deter deer or 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 the 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. 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).

Visual scaring techniques

Visual techniques such as use of mylar tape (highly reflective surface produces flashes of light), eye-spot balloons (the large eyes supposedly give deer a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing deer damage in a localized area for a limited time period.

Repellents

Repellents have had mixed results in reducing deer damage to shrubs and trees (Palmer et al. 1983, Matschke et al. 1984, Conover 1984, Hygnstrom and Craven 1988, Andelt et al. 1991, Craven and Hygnstrom 1994). Results are generally linked to deer numbers, availability of preferred food plant species, alternate food sources, season, and weather. Commercial repellents are costly ranging from \$20/gallon to \$80/gallon.

Repellents require continuous applications and are limited in their effectiveness. The effectiveness of a topical repellent is directly related to residue present on the plant. Rain, heavy dew and watering will remove the residue requiring reapplication of the material. The use of repellents can cause a decrease in native vegetation by shifting browsing pressure from protected plants to native flora. The effectiveness of repellents decreases as deer numbers increase and available food plants decrease.

LETHAL METHODS

Sharp shooting

Studies have suggested that localized management by removing deer is an effective tool where deer are causing undesirable effects (McNutly et al. 1997). This research supports the hypothesis that the removal of a small, localized group of white-tailed deer would create a population of low density in that localized area.

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

Only WS personnel, who have completed firearms safety training, have demonstrated skill and proficiency with the firearms used for deer removal, and have been approved for sharp shooting by the State Director in Pennsylvania will participate in sharp shooting 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 within three months of their appointment and a refresher course every two years afterwards (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are required to 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.

Live Capture and Euthanasia

Some situations restrict or do not warrant standard shooting operations. In such cases it may be appropriate to remove individual deer by trapping and euthanizing the animals. Clover traps, box traps, drop nets, and rocket nets are several methods that can be used to live capture deer. Deer that are live captured would subsequently be dispatched using a handgun or a rifle.

It is also possible to live capture deer using chemical immobilization drugs. The following are immobilizing drugs that could be used to capture deer:

Ketamine (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife, primarily mammals, birds, and reptiles. It is used to eliminate pain, calms fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Fowler and Miller 1999). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

Telazol (tiletamine) is another anesthetic used in wildlife capture. It is 2.5 to 5 times more potent than ketamine; therefore, it generally works faster and lasts longer. Currently, tiletamine can only be purchased as Telazol, which is a mixture of two drugs: tiletamine and zolazepam (a tranquilizer). Muscle tension varies with species. Telezol produces extensive muscle tension in dogs, but produces a more relaxed anesthesia in coyotes, wolves, and bears. It is often the drug of choice for these wild species (Fowler and Miller 1999). This drug is sold in a powder form and must be reconstituted with sterile water before use. Once mixed with sterile water, the shelf life is four days at room temperature and 14 days if refrigerated.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. When using ketamin/xylazine combinations, xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Fowler and

Miller 1999). This reduces heat production from muscle tension, but can lead to lower body temperatures when working in cold conditions.

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

Hunting Programs

WS sometimes recommends sport hunting as a viable damage management method when the deer can be legally hunted. A valid hunting license and other licenses or permits may be required by the PGC. This method provides sport and food for hunters and requires no cost to the landowner.

APPENDIX C

Federal and State Listed Threatened and
Endangered Species in Pennsylvania

**FEDERALLY LISTED, PROPOSED AND CANDIDATE SPECIES
 (in Pennsylvania)**

| <u>Common Name</u> | <u>Scientific Name</u> | <u>Status</u> ¹ | <u>Distribution (by County and/or Watershed)</u> |
|---------------------------------|-------------------------------------|----------------------------|---|
| <u>FISHES</u> | | | |
| Shortnose sturgeon ² | <i>Acipenser brevirostrum</i> | E | Delaware River & other Atlantic coastal waters |
| <u>REPTILES</u> | | | |
| Bog turtle | <i>Clemmys muhlenbergii</i> | T | Current - Adams, Berks, Bucks, Chester, Cumberland, Delaware, Franklin, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill, York. Historic - Crawford, Mercer, Philadelphia Co. |
| Eastern massasauga rattlesnake | <i>Sistrurus ctenatus ctenatus</i> | C | Current - Butler, Crawford, Mercer and Venango Co. Historic - Allegheny and Lawrence Co. |
| <u>BIRDS</u> | | | |
| Bald eagle | <i>Haliaeetus leucocephalus</i> | T | Suitable habitats across the state. Recent nesting in Butler, Cameron, Centre, Chester, Crawford, Dauphin, Erie, Forest, Huntingdon, Lancaster, Lebanon, Mercer, Northumberland, Pike, Tioga, Venango, Warren, Wayne and York Co. Wintering concentrations occur near ice-free confluences of rivers, lakes and reservoirs, including the Delaware River. |
| Piping plover | <i>Charadrius melodus</i> | E | Migratory. No nesting in Pennsylvania since 1950s. Designated critical habitat on Presque Isle, Erie Co. |
| <u>MAMMALS</u> | | | |
| Indiana bat | <i>Myotis sodalis</i> | E | Winter hibernacula: Armstrong, Blair, Lawrence, Luzerne, Mifflin and Somerset Co. |
| <u>MOLLUSKS</u> | | | |
| Dwarf wedgetinussel | <i>Alasmidonta heterodon</i> | E | Current - Delaware River (Wayne Co.). Historic - Delaware River watershed (Bucks, Carbon, Chester and Philadelphia Co.); Susquehanna River watershed (Lancaster Co.) |
| Clubshell mussel | <i>Pleurobema clava</i> | E | French Creek and Allegheny River watersheds (Clarion, Crawford, Erie, Forest, Mercer, Venango and Warren Co.); Shenango River (Ohio River watershed; Mercer and Crawford Co.) |
| Northern riffleshell | <i>Epioblasma torulosa rangiana</i> | E | French Creek and Allegheny River watersheds (Clarion, Crawford, Erie, Forest, Mercer, Venango and Warren Co.) |
| <u>PLANTS</u> | | | |
| Northeastern bulrush | <i>Scirpus ancistrochaetus</i> | E | Current - Adams, Bedford, Blair, Carbon, Centre, Clinton, Cumberland, Dauphin, Franklin, Huntingdon, Lackawanna, Lehigh, Lycoming, Mifflin, Monroe, Perry, Snyder and Union Co. Historic - Northampton Co. |
| Small-whorled pogonia | <i>Isotria medeoloides</i> | T | Current - Centre, Chester and Venango Co. Historic - Berks, Greene, Monroe, Montgomery and Philadelphia Co. |

¹ E = Endangered, T = Threatened, PE = Proposed Endangered, PT = Proposed Threatened, C = Candidate Revised 2/27/03
² Shortnose sturgeon is under the jurisdiction of the National Marine Fisheries Service

**FEDERALLY LISTED AND PROPOSED SPECIES
 THAT NO LONGER OCCUR IN PENNSYLVANIA**

| <u>COMMON NAME</u> | <u>SCIENTIFIC NAME</u> | <u>STATUS**</u> | <u>FORMER DISTRIBUTION</u> |
|---------------------------------|------------------------------------|-----------------|--|
| <u>MAMMALS</u> | | | |
| Canada lynx | <i>Lynx canadensis</i> | PT | north-central PA (Tioga Co.) |
| Delmarva Peninsula fox squirrel | <i>Sciurus niger cinereus</i> | E | mature forests of southeastern PA (Delaware and Chester Co.) |
| Eastern cougar | <i>Felis concolor cougar</i> | E | state-wide |
| Grey wolf | <i>Canis lupus</i> | E | state-wide |
| <u>MOLLUSKS</u> | | | |
| Fanshell* | <i>Cypronia stegaria</i> | E | Ohio River drainage |
| Orange pimpleback* | <i>Plethobasus striatus</i> | E | Ohio River drainage |
| Pink muskrat pearly mussel* | <i>Lampsilis abrupta</i> | E | Ohio River drainage |
| Ring pink mussel* | <i>Obovaria retusa</i> | E | Ohio River drainage |
| Rough pigtoe* | <i>Pleurobema plenum</i> | E | Ohio River drainage |
| <u>INSECTS</u> | | | |
| American burying beetle | <i>Nicrophorus americanus</i> | E | state-wide |
| Karnor blue butterfly | <i>Lycæides melissa samuelis</i> | E | pine barrens, oak savannas (wild lupine habitat) (Wayne Co.) |
| Northeastern beach tiger beetle | <i>Cicindela dorsalis dorsalis</i> | T | along large rivers in southeastern PA |
| <u>PLANTS</u> | | | |
| Eastern prairie fringed orchid | <i>Platanthera leucophaea</i> | T | wet prairies, bogs (Crawford Co.) |
| Sensitive joint-vetch | <i>Aeschynomene virginica</i> | T | freshwater tidal marshes of Delaware river (Delaware and Philadelphia Co.) |
| Virginia spiraea* | <i>Spiraea virginiana</i> | T | along Youghiogheny River (Fayette Co.) |
| Smooth coneflower | <i>Echinacea laevigata</i> | E | serpentine barrens (Lancaster Co.) |

Revised 10/19/00

* It is possible that remnant populations of some of these species (indicated with an *) may still occur in Pennsylvania, however, there have been no confirmed sightings of these species for over 70 years.

** E = Endangered, T = Threatened, PT = Proposed Threatened

The following is a partial list of additional species that no longer occur in Pennsylvania: moose, bison, wolverine, passenger pigeon, Bachman's sparrow, greater prairie-chicken, olive-sided flycatcher, Bewick's wren, eastern tiger salamander, blue pike, butterfly mussel, Diana fritillary butterfly, precipitous underwing moth, duette mussel, marbled underwing moth, cobblestone tiger beetle, mountain clubmoss, crested yellow orchid, red milkweed, American barberry, small white lady's slipper, etc.

Plants

| Scientific Name | Common Name | Global Rank | State Rank | State Status | 8/15/2003 | |
|----------------------------------|----------------------------------|-------------|------------|--------------|-----------------------|----------------|
| | | | | | Proposed State Status | Federal Status |
| ACALYPHA DEAMII | THREE-SEEDED MERCURY | G4? | SX | N | | PX |
| ACONITUM RECLINATUM | WHITE MONKSHOOD | G3 | S1 | PE | | PE |
| ACONITUM UNCINATUM | BLUE MONKSHOOD | G4 | S2 | PT | | PT |
| ACORUS AMERICANUS | SWEET FLAG | G5 | S1 | PE | | PE |
| ADIANTUM ALEUTICUM | ALEUTIAN MAIDENHAIR FERN | G5? | SR | TU | | TU |
| AESCHYNOMENE VIRGINICA | SENSITIVE JOINT-VETCH | G2 | SX | PX | | PX |
| AGALINIS AURICULATA | EARED FALSE-FOXGLOVE | G3 | S1 | PE | | PE |
| AGALINIS DECEMLOBA | BLUE-RIDGE FALSE-FOXGLOVE | G4Q | SX | PX | | PX |
| AGALINIS PAUPERCUA | SMALL-FLOWERED FALSE-FOXGLOVE | G5 | S1 | PE | | PE |
| AGROSTIS ALTISSIMA | TALL BENTGRASS | G4 | SX | PX | | PX |
| ALETRIS FARINOSA | COLIC-ROOT | G5 | S1 | TU | | PE |
| ALISMA TRIVIALE | BROAD-LEAVED WATER-PLANTAIN | G5 | S1 | PE | | PE |
| ALNUS VIRIDIS | MOUNTAIN ALDER | G5 | S1 | PE | | PE |
| ALOPECURUS AEQUALIS | SHORT-AWN FOXTAIL | G5 | S3 | N | | TU |
| AMARANTHUS CANNABINUS | WATERHEMP RAGWEED | G5 | S3 | PR | | PR |
| AMELANCHIER BARTRAMIANA | OBLONG-FRUITED SERVICEBERRY | G5 | S1 | PE | | PE |
| AMELANCHIER CANADENSIS | SERVICEBERRY | G5 | S7 | N | UEF | |
| AMELANCHIER HUMILIS | SERVICEBERRY | G5 | S1 | TU | | PE |
| AMELANCHIER OBOVALIS | COASTAL JUNE BERRY | G4G5 | S1 | TU | | PE |
| AMELANCHIER SANGUINEA | ROUNDLEAF SERVICEBERRY | G5 | S1 | TU | | PE |
| AMMANNIA COCCINEA | SCARLET AMMANNIA | G5 | S2 | PE | | PT |
| AMMOPHILA BREVILIGULATA | AMERICAN BEACHGRASS | G5 | S2 | PT | | PT |
| ANDROMEDA POLIFOLIA | BOG-ROSEMARY | G5 | S3 | PR | | PR |
| ANDROPOGON GLOMERATUS | BUSHY BLUESTEM | G5 | S3 | TU | | PR |
| ANDROPOGON GYRANS | ELLIOTT'S BEARDGRASS | G5 | S3 | N | | PR |
| ANEMONE CYLINDRICA | LONG-FRUITED ANEMONE | G5 | S1 | PE | | PE |
| ANTENNARIA SOLITARIA | SINGLE-HEADED PUSSY-TOES | G5 | S1 | TU | | PE |
| ANTENNARIA VIRGINICA | SHALE BARREN PUSSYTOES | G4 | S3 | N | | PR |
| APLECTRUM HYEMALE | PUTTYROOT | G5 | S3 | PR | | PR |
| ARABIS HIRSUTA | WESTERN HAIRY ROCK-CRESS | G5 | S1 | TU | | PE |
| ARABIS MISSOURIENSIS | MISSOURI ROCK-CRESS | G4G5Q | S1 | PE | | PE |
| ARABIS PATENS | SPREADING ROCKCRESS | G3 | S2 | N | | PT |
| ARCEUTHOBIUM PUSILLUM | DWARF MISTLETOE | G5 | S2 | PT | | PT |
| ARCTOSTAPHYLOS UVA-URSI | BEARBERRY MANZANITA | G5 | SX | PX | | PX |
| ARETHUSA BULBOSA | SWAMP-PINK | G4 | S1 | PE | | PE |
| ARISTIDA DICHOTOMA VAR CURTISSII | THREE-AWNED GRASS | G5T5 | SH | TU | | TU |
| ARISTIDA PURPURASCENS | ARROW-FEATHERED THREE-AWNED | G5 | S2 | PT | | PT |
| ARNICA ACAULIS | LEOPARD'S-BANE | G5 | S1 | PE | | PE |
| ARTEMISIA CAMPESTRIS SSP CAUDATA | BEACH WORMWOOD | G5T5 | S1 | PE | | PE |
| ASCLEPIAS RUBRA | RED MILKWEED | G4G5 | SX | PX | | PX |
| ASCLEPIAS VARIEGATA | WHITE MILKWEED | G5 | S1 | TU | | PE |
| ASPLENIUM BRADLEYI | BRADLEY'S SPLEENWORT | G4 | S1 | PT | | PE |
| ASPLENIUM PINNATIFIDUM | LOBED SPLEENWORT | G4 | S3 | N | | PR |
| ASPLENIUM RESILIENS | BLACK-STEMMED SPLEENWORT | G5 | S1 | PE | | PE |
| ASTER BOREALIS | RUSH ASTER | G5 | S1 | PE | | PE |
| ASTER DEPAUPERATUS | SERPENTINE ASTER | G2 | S2 | PT | | PT |
| ASTER DRUMMONDII | HAIRY HEART-LEAVED ASTER | G5 | SH | N | | PE |
| ASTER DUMOSUS | BUSHY ASTER | G5 | S2 | TU | | TU |
| ASTER ERICOIDES | WHITE HEATH ASTER | G5 | S3 | TU | | TU |
| ASTER NEMORALIS | BOG ASTER | G5 | S1 | PE | | PE |
| ASTER NOVI-BELGII | NEW YORK ASTER | G5 | S2 | PT | | PT |
| ASTER PRAEALTUS | VEINY-LINED ASTER | G5 | S3 | N | | TU |
| ASTER PUNICEUS VAR FIRMUS | FIRM ASTER | G5T5 | S2 | TU | | PT |
| ASTER RADULA | ROUGH-LEAVED ASTER | G5 | S2 | N | | PT |
| ASTER SOLIDAGINEUS | NARROW-LEAVED WHITE-TOPPED ASTER | G5 | S1 | PE | | PE |
| ASTER SPECTABILIS | LOW SHOWY ASTER | G5 | S1 | PE | | PE |
| ASTRAGALUS CANADENSIS | CANADIAN MILKVETCH | G5 | S2 | N | | TU |
| ASTRAGALUS NEGLECTUS | COOPER'S MILK-VETCH | G4 | S1 | PE | | PE |
| BACCHARIS HALIMIFOLIA | EASTERN BACCHARIS | G5 | S3 | PR | | PR |
| BAPTISIA AUSTRALIS | BLUE FALSE-INDIGO | G5 | S3 | N | | TU |
| BARTONIA PANICULATA | SCREW-STEM | G5 | S3 | N | | TU |
| BERBERIS CANADENSIS | AMERICAN BARBERRY | G3 | SX | PX | | PX |
| BIDENS BIDENTOIDES | SWAMP BEGGAR-TICKS | G3 | S1 | PT | | PE |
| BIDENS DISCOIDEA | SMALL BEGGAR-TICKS | G5 | S3 | N | | PR |
| BIDENS LAEVIS | BEGGAR-TICKS | G5 | S3 | N | | TU |
| BOLTONIA ASTEROIDES | ASTER-LIKE BOLTONIA | G5 | S1 | PE | | PE |

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| BOUTELLOA CURTIPENDULA | FALL GRAMA | G5 | S2 | P1 | P1 |
| BROMUS KALMII | BROME GRASS | G5 | S3 | N | TU |
| BUCHNERA AMERICANA | BLUEHEARTS | G57 | SX | PX | PX |
| CACALIA MUEHLENBERGII | GREAT INDIAN-PLANTAIN | G4 | S1 | N | PE |
| CAKILE EDENTULA | AMERICAN SEA-ROCKET | G5 | S3 | PR | PR |
| CALYCANTHUS FLORIDUS VAR LAEVIGATUS | SWEET-SHRUB | G5T5Q | SH | N | TU |
| CAMASSIA SCILLOIDES | WILD HYACINTH | G4G5 | S1 | PT | PE |
| CARDAMINE MAXIMA | LARGE TOOTHWORT | G5Q | S1 | N | TU |
| CARDAMINE PRATENSIS VAR PALUSTRIS | CUCKOOFLOWER | G5T5 | S1 | PE | TU |
| CAREX ADUSTA | CROWDED SEDGE | G5 | SX | PX | PX |
| CAREX ALATA | BROAD-WINGED SEDGE | G5 | S2 | PT | PT |
| CAREX AQUATILIS | WATER SEDGE | G5 | S2 | PT | PT |
| CAREX ATHERODES | AWNED SEDGE | G5 | S1 | PE | PE |
| CAREX AUREA | GOLDEN-FRUITED SEDGE | G5 | S1 | PE | PE |
| CAREX BACKII | ROCKY MOUNTAIN SEDGE | G4 | SX | PX | PX |
| CAREX BARRATTII | BARRATT'S SEDGE | G4 | SX | PX | PX |
| CAREX BEBBII | BEBB'S SEDGE | G5 | S1 | PE | PE |
| CAREX BICKNELLII | BICKNELL'S SEDGE | G5 | S1 | PE | PE |
| CAREX BREVIOR | A SEDGE | G5? | S2? | N | TU |
| CAREX BULLATA | BULL SEDGE | G5 | S1 | PE | PE |
| CAREX BUXBAUMII | BROWN SEDGE | G5 | S3 | TU | PR |
| CAREX CAREYANA | CAREY'S SEDGE | G5 | S1 | PE | PE |
| CAREX CHORDORRHIZA | CREEPING SEDGE | G5 | SX | PX | PX |
| CAREX COLLINSII | COLLIN'S SEDGE | G4 | S2 | PE | PT |
| CAREX CRAWFORDII | CRAWFORD'S SEDGE | G5 | S1 | TU | PE |
| CAREX CRINITA VAR BREVICRINIS | SHORT HAIR SEDGE | G5T5 | S1 | PE | PE |
| CAREX CRYPTOLEPIS | NORTHEASTERN SEDGE | G4 | S1 | PT | PE |
| CAREX DIANDRA | LESSER PANICLED SEDGE | G5 | S2 | PT | PT |
| CAREX DISPERMA | SOFT-LEAVED SEDGE | G5 | S3 | PR | PR |
| CAREX EBURNEA | EBONY SEDGE | G5 | S1 | PE | PE |
| CAREX FLAVA | YELLOW SEDGE | G5 | S2 | PT | PT |
| CAREX FOENEA | A SEDGE | G5 | S1 | PE | PE |
| CAREX FORMOSA | HANDSOME SEDGE | G4 | S1 | PE | PE |
| CAREX GARBERI | ELK SEDGE | G4 | S1 | PE | PE |
| CAREX GEYERI | GEYER'S SEDGE | G5 | S1 | PE | PE |
| CAREX HAYDENII | CLOUD SEDGE | G5 | S1S2 | TU | PT |
| CAREX HYALINOLEPIS | SHORE-LINE SEDGE | G4G5 | SX | PX | PX |
| CAREX LASIOCARPA | SLENDER SEDGE | G5 | S3 | PR | PR |
| CAREX LIMOSA | MUD SEDGE | G5 | S2 | TU | PT |
| CAREX LONGII | LONG'S SEDGE | G5 | SU | TU | TU |
| CAREX LUPULIFORMIS | FALSE HOP SEDGE | G4 | S1 | TU | TU |
| CAREX MEADII | MEAD'S SEDGE | G4G5 | S1 | TU | PE |
| CAREX MITCHELLIANA | MITCHELL'S SEDGE | G3G4 | S1 | PE | PE |
| CAREX OLIGOSPERMA | FEW-SEEDED SEDGE | G4 | S2 | PT | PT |
| CAREX ORMOSTACHYA | SPIKE SEDGE | G4 | S2 | N | TU |
| CAREX PAUCIFLORA | FEW-FLOWERED SEDGE | G5 | S1 | PE | PE |
| CAREX PAUPERCULA | BOG SEDGE | G5 | S3 | PT | PR |
| CAREX POLYMORPHA | VARIABLE SEDGE | G3 | S2 | PE | PT |
| CAREX PRAIREA | PRAIRIE SEDGE | G5? | S2 | PT | PT |
| CAREX PSEUDOCYPERUS | CYPERUS-LIKE SEDGE | G5 | S1 | PE | PE |
| CAREX RETRORSA | BACKWARD SEDGE | G5 | S1 | PE | PE |
| CAREX RICHARDSONII | RICHARDSON'S SEDGE | G4 | S1 | N | PE |
| CAREX SARTWELLII | SARTWELL'S SEDGE | G4G5 | SX | PX | PX |
| CAREX SCHWEINITZII | SCHWEINITZ'S SEDGE | G3 | S1 | PT | PE |
| CAREX SHORTIANA | SEDGE | G5 | S3 | N | PR |
| CAREX SICCATA | A SEDGE | G5 | S2 | N | TU |
| CAREX SPRENGELII | SEDGE | G5? | S3 | N | PR |
| CAREX STERILIS | STERILE SEDGE | G4 | S1 | PT | PE |
| CAREX TETANICA | A SEDGE | G4G5 | S2 | PT | PT |
| CAREX TYPHINA | CATTAIL SEDGE | G5 | S2 | PE | PT |
| CAREX VIRIDULA | GREEN SEDGE | G5 | S1 | PE | PE |
| CAREX WIEGANDII | WIEGANDS SEDGE | G3 | S1 | PT | PT |
| CASTILLEJA COCCINEA | SCARLET INDIAN-PAINTBRUSH | G5 | S2 | TU | PT |
| CERASTIUM ARVENSE VAR VILLOSISSIMUM | SERPENTINE CHICKWEED | G5T1Q | S1 | PE | PE |
| CHAMAECYPARIS THYOIDES | ATLANTIC WHITE CEDAR | G4 | SX | PX | PX |
| CHAMAESYCE POLYGONIFOLIA | SMALL SEA-SIDE SPURGE | G57 | S2 | PT | PT |
| CHASMANTHIUM LATIFOLIUM | WILD OAT | G5 | S1 | TU | PE |
| CHASMANTHIUM LAXUM | SLENDER SEA-OATS | G5 | S1 | PE | PE |
| CHENOPODIUM CAPITATUM | STRAWBERRY GOOSEFOOT | G5 | SH | TU | TU |
| CHENOPODIUM FOGGII | FOGG'S GOOSEFOOT | G3Q | S1 | PE | PE |
| CHIONANTHUS VIRGINICUS | FRINGE-TREE | G5 | S3 | N | PT |
| CHRYSOGONUM VIRGINIANUM | GREEN-AND-GOLD | G5 | S1 | PE | PE |
| CHRYSOPSIS MARIANA | MARYLAND GOLDEN-ASTER | G5 | S1 | PT | PE |
| CIMICIFUGA AMERICANA | MOUNTAIN BUGBANE | G4 | S3 | PT | PR |
| CIRSIIUM HORRIDULUM | HORRIBLE THISTLE | G5 | S1 | PE | PE |
| CLADIUM MARISCOIDES | TWIG RUSH | G5 | S2 | PE | PE |
| CLEMATIS VIORNA | VASE-VINE LEATHER-FLOWER | G5 | S1 | PE | PE |
| CLETHRA ACUMINATA | MOUNTAIN PEPPER-BUSH | G4 | S1 | PE | PE |

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| COELOGLOSSUM VIRIDE | LONG-BRACTED GREEN ORCHID | G5 | SH | TU | TU |
| COMMELINA ERECTA | SLENDER DAY-FLOWER | G5 | SX | PX | PX |
| COMMELINA VIRGINICA | VIRGINIA DAY-FLOWER | G5 | SX | PX | PX |
| CONIOSELINUM CHINENSE | HEMLOCK-PARSLEY | G5 | S1 | PE | PE |
| CORALLORHIZA WISTERIANA | SPRING CORAL-ROOT | G5 | S1 | TU | PE |
| COREOPSIS ROSEA | PINK TICKSEED | G3 | SX | PX | PX |
| CORYDALIS AUREA | GOLDEN CORYDALIS | G5 | S1 | N | PE |
| CRASSULA AQUATICA | WATER PIGMY-WEED | G5 | SX | PX | PX |
| CRATAEGUS BRAINERDII | BRAINERD'S HAWTHORNE | G5 | SU | TU | TU |
| CRATAEGUS DILATATA | A HAWTHORN | G4 | SU | N | TU |
| CRATAEGUS MOLLIS | DOWNY HAWTHORNE | G5 | SU | TU | TU |
| CRATAEGUS PENNSYLVANICA | RED-FRUITED HAWTHORN | G3Q | S2S3 | N | TURF |
| CRITESION PUSILLUM | LITTLE BARLEY | G5 | SH | PX | PX |
| CROTONOPSIS ELLIPTICA | ELLIPTICAL RUSHFOIL | G5 | SX | PX | PX |
| CRYPTOGRAMMA STELLERI | SLENDER ROCK-BRAKE | G5 | S1 | PE | PE |
| CUSCUTA CAMPESTRIS | DODDER | G5T5 | S2 | N | TU |
| CUSCUTA CEPHALANTHI | BUTTON-BUSH DODDER | G5 | SU | TU | TU |
| CUSCUTA COMPACTA | DODDER | G5 | S3 | N | TU |
| CUSCUTA CORYLI | HAZEL DODDER | G5 | SU | TU | TU |
| CUSCUTA PENTAGONA | FIELD DODDER | G5 | S3 | N | TU |
| CUSCUTA POLYGONORUM | SMARTWEED DODDER | G5 | SU | TU | TU |
| CYMOPHYLLUS FRASERIANUS | FRASER'S SEDGE | G4 | S1 | PE | PE |
| CYNANCHUM LAEVE | SMOOTH SWALLOW-WORT | G5 | SU | PE | PE |
| CYNOGLOSSUM BOREALE | NORTHERN HOUND'S-TONGUE | G4 | SH | PX | PX |
| CYPERUS DIANDRUS | UMBRELLA FLATSEDEGE | G5 | S2 | PE | PE |
| CYPERUS HOUGHTONII | HOUGHTON'S FLATSEDEGE | G4? | S1 | PE | PE |
| CYPERUS LANCASTRIENSIS | MANY-FLOWERED UMBRELLA SEDEGE | G5 | S2 | N | TU |
| CYPERUS POLYSTACHYOS | MANY-SPIKED FLATSEDEGE | G5 | SX | PX | PX |
| CYPERUS REFRACTUS | REFLEXED FLATSEDEGE | G5 | S1 | PE | PE |
| CYPERUS RETRORSUS | RETROSE FLATSEDEGE | G5 | SH | PE | PX |
| CYPERUS SCHWEINITZII | SCHWEINITZ'S FLATSEDEGE | G5 | S2 | PR | PR |
| CYPRIPEDIUM CALCEOLUS VAR PARVIFLORUM | SMALL YELLOW LADY'S-SLIPPER | G5 | S1 | PE | PE |
| CYPRIPEDIUM CANDIDUM | SMALL WHITE LADY'S-SLIPPER | G4 | SX | PX | PX |
| CYPRIPEDIUM REGINAE | SHOWY LADY'S-SLIPPER | G4 | S2 | PT | PT |
| CYSTOPTERIS LAURENTIANA | LAURENTIAN BLADDER-FERN | G3 | S1 | TU | PE |
| CYSTOPTERIS TENNESSEENSIS | BLADDER FERN | G5 | S1 | N | TU |
| DELPHINIUM EXALTATUM | TALL LARKSPUR | G3 | S1 | PE | PE |
| DESCHAMPSIA CESPITOSA | TUFTED HAIRGRASS | G5 | S3 | N | TU |
| DESMODIUM GLABELLUM | TALL TICK-TREFOIL | G5 | SU | TU | TU |
| DESMODIUM LAEVIGATUM | SMOOTH TICK-TREFOIL | G5 | SU | N | TU |
| DESMODIUM NUTTALLII | NUTTALLS' TICK-TREFOIL | G5 | S2 | TU | TU |
| DESMODIUM OBTUSUM | STIFF TICK-TREFOIL | G4G5 | SU | N | TU |
| DESMODIUM SESSILIFOLIUM | SESSILE-LEAVED TICK-TREFOIL | G5 | SX | PX | PX |
| DESMODIUM VIRIDIFLORUM | VELVETY TICK-TREFOIL | G5? | SU | N | TU |
| DIARRHENA OBOVATA | AMERICAN BEAKGRAIN | G4G5 | S3 | PE | PR |
| DICENTRA EXIMIA | WILD BLEEDING-HEARTS | G4 | S1 | PE | PE |
| DIPHASIASTRUM SABINIFOLIUM | FIR CLUBMOSS | G4 | SX | PX | PX |
| DODECATHEON MEADIA | COMMON SHOOTING-STAR | G5 | S1 | PE | PE |
| DODECATHEON RADICATUM | JEWELLED SHOOTING-STAR | G7 | S2 | PT | PT |
| DRABA REPTANS | CAROLINA WHITLOW-GRASS | G5 | SH | PX | PX |
| DRACOCEPHALUM PARVIFLORUM | AMERICAN DRAGONHEAD | G5 | SH | TU | TU |
| DRYOPTERIS CAMPYLOPTERA | MOUNTAIN WOOD FERN | G5 | S1 | PE | PE |
| DRYOPTERIS CELSA | LOG FERN | G4 | S1 | N | PE |
| DRYOPTERIS CLINTONIANA | CLINTON'S WOOD FERN | G5 | S2 | N | PT |
| ECHINACEA LAEVIGATA | SMOOTH CONEFLOWER | G2 | SX | PX | PX |
| ECHINOCHLOA WALTERI | WALTER'S BARNYARD-GRASS | G5 | S1 | PE | PE |
| ELATINE AMERICANA | LONG-STEMMED WATER-WORT | G4 | SH | PX | PE |
| ELEOCHARIS CARIBAEA | CAPITATE SPIKE-RUSH | G4G5 | S1 | PE | PE |
| ELEOCHARIS COMPRESSA | FLAT-STEMMED SPIKE-RUSH | G4 | S1 | PE | PE |
| ELEOCHARIS ELLIPTICA | SLENDER SPIKE-RUSH | G5 | S2 | PE | PE |
| ELEOCHARIS INTERMEDIA | MATTED SPIKE-RUSH | G5 | S2 | PT | PT |
| ELEOCHARIS OBTUSA VAR PEASEI | WRIGHTS SPIKE RUSH | G5T5 | S1 | PE | PE |
| ELEOCHARIS PARVULA | LITTLE-SPIKE SPIKE-RUSH | G5 | S1 | PE | PE |
| ELEOCHARIS PAUCIFLORA VAR FERNALDII | FEW-FLOWERED SPIKE-RUSH | G5T? | S1 | PE | PE |
| ELEOCHARIS QUADRANGULATA | FOUR-ANGLED SPIKE-RUSH | Q | S1 | PE | PE |
| ELEOCHARIS ROBBINSII | ROBBINS' SPIKE-RUSH | G4 | S1 | PE | PE |
| ELEOCHARIS ROSTELLATA | BEAKED SPIKE-RUSH | G4G5 | S2 | PT | PT |
| ELEOCHARIS TENUIS VAR VERRUCOSA | SLENDER SPIKE-RUSH | G5 | S1 | PE | PE |
| ELEOCHARIS TRICOSTATA | THREE-RIBBED SPIKE-RUSH | G5T3T5 | S1 | PE | PE |
| ELEOCHARIS TUBERCULOSA | LONG-TUBERCLED SPIKE-RUSH | G4 | SX | PX | PX |
| ELEPHANTOPUS CAROLINIANUS | ELEPHANT'S FOOT | G5 | SX | PX | PX |
| ELLISIA NYCTELEA | ELLISIA | G5 | S1 | PE | PE |
| ELODEA SCHWEINITZII | SCHWEINITZ'S WATERWEED | G5 | S2 | PT | PT |
| ELYMUS TRACHYCAULUS | SLENDER WHEATGRASS | GHQ | SX | PX | PX |
| EPILOBIUM PALUSTRE | MARSH WILLOW-HERB | G5 | S3 | N | TU |
| EPILOBIUM STRICTUM | DOWNY WILLOW-HERB | G5 | S1 | TU | TU |
| | | G5? | S3 | PE | PR |

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| EQUISETUM VARIEGATUM | VARIEGATED HORSETAIL | G5 | S1 | PE | PE |
| EQUISETUM X FERRISSII | SCOURING-RUSH | HYB | S1 | N | PE |
| ERIANTHUS GIGANTEUS | SUGAR CANE PLUMEGRASS | G5 | SX | PX | PX |
| ERIGENIA BULBOSA | HARBINGER-OF-SPRING | G5 | S2 | PT | PT |
| ERIOCAULON DECANGULARE | TEN-ANGLE PIPEWORT | G5 | SX | PX | PX |
| ERIOCAULON PARKERI | PARKER'S PIPEWORT | G3 | SX | PX | PX |
| ERIOPHORUM GRACILE | SLENDER COTTON-GRASS | G5 | S1 | PE | PE |
| ERIOPHORUM TENELLUM | ROUGH COTTON-GRASS | G5 | S1 | PE | PE |
| ERIOPHORUM VIRIDICARINATUM | THIN-LEAVED COTTON-GRASS | G5 | S2 | PT | PT |
| ERYNGIUM AQUATICUM | MARSH ERYNGO | G4 | SX | PX | PX |
| ERYTHRONIUM ALBIDUM | WHITE TROUT-LILY | G5 | S3 | N | TU |
| EUPATORIUM ALBUM | WHITE THOROUGHWORT | G5 | SH | PX | PX |
| EUPATORIUM AROMATICUM | SMALL WHITE-SNAKEROOT | G5 | S3 | N | PR |
| EUPATORIUM COELESTINUM | MISTFLOWER | G3 | S3 | N | TU |
| EUPATORIUM GODFREYANUM | VASEY'S EUPATORIUM | G4 | S2 | N | TU |
| EUPATORIUM LELUCOLEPIS | WHITE-BRACTED THOROUGHWORT | G5 | SX | PX | PX |
| EUPATORIUM ROTUNDIFOLIUM | A EUPATORIUM | G5 | S3 | TU | UTF |
| EUPHORBIA IPECACUANHAE | WILD IPECAC | G5? | S1 | PE | PE |
| EUPHORBIA OBTUSATA | BLUNT-LEAVED SPURGE | G5 | S1 | PE | PE |
| EUPHORBIA PURPUREA | GLADE SPURGE | G3 | S1 | PE | PE |
| EUTHAMIA TENUIFOLIA | GRASS-LEAVED GOLDENROD | G5 | S1 | PT | PT |
| FESTUCA PARADOXA | CLUSTER FESCUE | G5 | S1 | PE | PE |
| FILIPENDULA RUBRA | QUEEN-OF-THE-PAIRIE | G4G5 | S1S2 | TU | TU |
| FIMBRISTYLIS ANNUA | ANNUAL FIMBRY | G5 | S2 | PT | PT |
| FIMBRISTYLIS PUBERULA | HAIRY FIMBRY | G5 | SX | PX | PX |
| FRAXINUS PROFUNDA | PUMPKIN ASH | G4 | S1 | N | PE |
| GALACTIA REGULARIS | EASTERN MILK-PEA | G5 | SX | PX | PX |
| GALACTIA VOLUBILIS | DOWNY MILK-PEA | G5 | SX | PX | PX |
| GALIUM LABRADORICUM | LABRADOR MARSH BEDSTRAW | G5 | S1 | PE | PE |
| GALIUM LATIFOLIUM | PURPLE BEDSTRAW | G5 | S3 | N | TU |
| GALIUM TRIFIDUM | MARSH BEDSTRAW | G5 | S2 | N | PR |
| GAULTHERIA HISPIDULA | CREEPING SNOWBERRY | G5 | S3 | PR | PR |
| GAYLUSSACIA BRACHYCERA | BOX HUCKLEBERRY | G2G3 | S1 | PT | PE |
| GAYLUSSACIA DUMOSA | DWARF HUCKLEBERRY | G5 | SH | PE | PE |
| GENTIANA ALBA | YELLOW GENTIAN | G4 | SH | TU | PX |
| GENTIANA CATESBAEI | ELLIOTT'S GENTIAN | G5 | SX | PX | PX |
| GENTIANA LINEARIS | NARROW-LEAVED GENTIAN | G4G5 | S3 | N | PR |
| GENTIANA SAPONARIA | SOAPWORT GENTIAN | G5 | S1S2 | TU | PE |
| GENTIANA VILLOSA | STRIPED GENTIAN | G4 | S1 | TU | PE |
| GENTIANOPSIS VIRGATA | LESSER FRINGED GENTIAN | G5 | SX | PX | PX |
| GERANIUM BICKNELLII | CRANESBILL | G5 | S1 | PE | PE |
| GLYCERIA BOREALIS | SMALL-FLOATING MANNA-GRASS | G5 | S2 | PE | PT |
| GLYCERIA OBTUSA | BLUNT MANNA-GRASS | G5 | S1 | PE | PE |
| GNAPHALIUM SYLVATICUM | CUDWEED | G5 | SH | N | TU |
| GOODYERA REPENS | LESSER RATTLESNAKE-PLANTAIN | G5 | S2 | N | TU |
| GOODYERA TESSELATA | CHECKERED RATTLESNAKE-PLANTAIN | G5 | S1 | TU | PT |
| GRATIOLA AUREA | GOLDEN HEDGE-HYSSOP | G5 | S1 | TU | PE |
| GYMNOCARPIUM | APPALACHIAN OAK FERN | G3 | S1 | TU | PE |
| APPALACHIANUM | A FERN HYBRID (STERILE TRIPLOID) | HYB | SX | N | PX |
| GYMNOCARPIUM X HETEROSPORUM | BROAD-LEAVED BEARDGRASS | G4 | SX | PE | PX |
| GYMNOPOGON AMBIGUUS | BICKNELL'S HOARY ROCKROSE | G5 | S2 | PE | PE |
| HELIANTHEMUM BICKNELLII | LOW ROCKROSE | G4 | SU | N | TU |
| HELIANTHEMUM PROPINQUUM | SWAMP SUNFLOWER | G5 | SX | PX | PX |
| HELIANTHUS ANGUSTIFOLIUS | SUNFLOWER | G5 | S2 | N | TU |
| HELIANTHUS HIRSUTUS | SMALL WOOD SUNFLOWER | G5 | S3 | N | TU |
| HELIANTHUS MICROCEPHALUS | SUNFLOWER | G5 | SH | N | PX |
| HELIANTHUS OCCIDENTALIS | MULTIFLOWERED MUD-PLANTAIN | G4 | S1 | PE | PE |
| HETERANTHERA MULTIFLORA | CANADA HAWKWEED | G5 | S3 | N | TU |
| HIERACIUM KALMII | MARYLAND HAWKWEED | G4 | S1 | PE | PE |
| HIERACIUM TRAILLII | VANILLA SWEET-GRASS | G5 | S1 | PE | PE |
| HIEROCHLOE ODORATA | AMERICAN FEATHERFOIL | G4 | SX | PX | PX |
| HOTTONIA INFLATA | PURPLE BLUETS | G5G5 | SU | TU | TU |
| HOUSTONIA PURPUREA VAR PURPUREA | CREEPING BLUETS | G4? | S1 | N | PE |
| HOUSTONIA SERPYLLIFOLIA | ROCK CLUBMOSS | G4 | S1 | PE | PE |
| HUPERZIA POROPHILA | MANY-FLOWERED PENNYWORT | G5 | SH | PX | PX |
| HYDROCOTYLE UMBELLATA | LARGE-LEAVED WATERLEAF | G5 | S1 | PE | PE |
| HYDROPHYLLUM | CREEPING ST. JOHN'S-WORT | G2G3 | SX | PX | PX |
| MACROPHYLLUM | ST PETER'S-WORT | G5 | SX | PX | PX |
| HYPERICUM ADPRESSUM | BUSHY ST. JOHN'S-WORT | G5 | S3 | PT | PR |
| HYPERICUM CRUX-ANDREAE | COPPERY ST. JOHN'S-WORT | G5 | SX | PX | PX |
| HYPERICUM DENSIFLORUM | NITS-AND-LICE | G5 | SX | TU | PX |
| HYPERICUM DENTICULATUM | CLASPING-LEAVED ST. JOHN'S-WORT | G4 | S1 | PX | PE |
| HYPERICUM DRUMMONDII | LARGER CANADIAN ST. JOHN'S-WORT | G5 | S2 | PT | PT |
| HYPERICUM GYMNANTHUM | | | | | |
| HYPERICUM MAJUS | | | | | |

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| ILEX GLABRA | INK-BERRY | G5 | SX | PX | PX |
| ILEX OPACA | AMERICAN HOLLY | G5 | S2 | PT | PT |
| IODANTHUS PINNATIFIDUS | PURPLE ROCKET | G5 | S1 | PE | PE |
| IRIS CRISTATA | CRESTED DWARF IRIS | G6 | S1 | PE | PE |
| IRIS PRISMATICA | SLENDER BLUE IRIS | G4G5 | S1 | PE | PE |
| IRIS VERNA | DWARF IRIS | G5 | S1 | PE | PE |
| IRIS VIRGINICA | VIRGINIA BLUE FLAG | G5 | S2 | N | PE |
| ISOETES VALIDA | QUILLWORT | G4? | SU | N | TU |
| ISOETES X BRITTONII | QUILLWORT | HYB | SU | N | TU |
| ISOTRIA MEDEOLOIDES | SMALL-WHORLED POGONIA | G2 | S1 | PE | PE |
| ITEA VIRGINICA | VIRGINIA WILLOW | G4 | S1 | PX | PE |
| JUNCUS ALPINOARTICULATUS | RICHARDSON'S RUSH | G5T5? | S2 | PT | PT |
| SSP NODULOSUS | | | | | |
| JUNCUS ARCTICUS VAR | | | | | |
| LITTORALIS | BALTIC RUSH | G5T5 | S2 | PT | PT |
| JUNCUS BIFLORUS | GRASS-LEAVED RUSH | G6 | S2 | TU | PT |
| JUNCUS BRACHYCARPUS | SHORT-FRUITED RUSH | G4G5 | S1 | PE | PE |
| JUNCUS BRACHYCEPHALUS | SMALL-HEADED RUSH | G5 | S2 | PT | PT |
| JUNCUS DEBILIS | WEAK RUSH | G5 | S3 | N | TU |
| JUNCUS DICHOTOMUS | FORKED RUSH | G5 | S1 | PE | PE |
| JUNCUS FILIFORMIS | THREAD RUSH | G5 | S3 | PR | PR |
| JUNCUS GREENEI | GREENE'S RUSH | G5 | SX | PX | PX |
| JUNCUS MILITARIS | BAYONET RUSH | G4 | S1 | PE | PE |
| JUNCUS SCIRPOIDES | SCIRPUS-LIKE RUSH | G5 | S1 | PE | PE |
| JUNCUS TORREYI | TORREY'S RUSH | G5 | S2 | PT | PE |
| JUNIPERUS COMMUNIS | COMMON JUNIPER | G5 | S2 | N | TU |
| KOELERIA MACRANTHA | JUNEGRASS | G5 | SX | PX | PX |
| LACTUCA HIRSUTA | DOWNY LETTUCE | G5? | S3 | N | TU |
| LATHYRUS JAPONICUS | BEACH PEAVINE | G5 | S2 | PT | PT |
| LATHYRUS OCHROLEUCUS | WILD-PEA | G4G5 | S1 | PT | PT |
| LATHYRUS PALUSTRIS | VETCHLING | G5 | S1 | TU | PE |
| LATHYRUS VENOSUS | VEINY PEA | G5 | S2 | N | TU |
| LECHEA MINOR | THYME-LEAVED PINWEED | G5 | SU | N | TU |
| LEDUM GROENLANDICUM | COMMON LABRADOR-TEA | G5 | S3 | PR | PR |
| LEIOPHYLLUM BUXIFOLIUM | SAND-MYRTLE | G4 | SX | PX | PX |
| LEMNA OBSCURA | LITTLE WATER DUCKWEED | G5 | SX | PX | PX |
| LEMNA PERPUSILLA | MINUTE DUCKWEED | G5 | SU | N | TU |
| LEMNA TURIONIFERA | A DUCKWEED | G5 | SU | TU | TU |
| LEMNA VALDIVIANA | PALE DUCKWEED | G5 | SH | FX | FX |
| LESPEDEZA ANGUSTIFOLIA | NARROWLEAF BUSHCLOVER | G5 | S1 | PE | PE |
| LESPEDEZA STUEVEI | TALL BUSH CLOVER | G4? | SX | PX | PX |
| LEUCOTHOE RACEMOSA | SWAMP DOG-HOBBLE | G5 | S2S3 | TU | PT |
| LIATRIS SCARIOSA | ROUND-HEAD GAYFEATHER | G5? | S2 | N | PT |
| LIGUSTICUM CANADENSE | NONDO LOVAGE | G4 | SH | PE | PE |
| LIMOSELLA AUSTRALIS | AWL-SHAPED MUDWORT | G4G5 | SX | FX | PX |
| LINNAEA BOREALIS | TWINFLOWER | G5 | S1 | PT | PE |
| LINUM INTERCURSUM | SANDPLAIN WILD FLAX | G4 | S1 | PE | PE |
| LINUM SULCATUM | GROOVED YELLOW FLAX | G5 | S1 | PE | PE |
| LIPOCARPHA MICRANTHA | COMMON HEMICARPA | G4 | S1 | PE | PE |
| LISTERA AUSTRALIS | SOUTHERN TWAYBLADE | G4 | S1 | PE | PE |
| LISTERA CORDATA | HEART-LEAVED TWAYBLADE | G5 | S1 | PE | PE |
| LISTERA SMALLII | KIDNEY-LEAVED TWAYBLADE | G4 | S1 | PE | PE |
| LITHOSPERMUM CANESCENS | HOARY PUCCOON | G5 | S2 | N | TU |
| LITHOSPERMUM CAROLINIENSE | HISPID GROMWELL | G4G5 | S1 | PE | PE |
| LITHOSPERMUM LATIFOLIUM | AMERICAN GROMWELL | G4 | S3 | PE | PR |
| LOBELIA DORTMANNIA | WATER LOBELIA | G4 | S2 | PT | PT |
| LOBELIA KALMII | BROOK LOBELIA | G5 | S1 | PE | PE |
| LOBELIA NUTTALLII | NUTTALL'S LOBELIA | G4G5 | SX | PX | PX |
| LOBELIA PUBERULA | DOWNY LOBELIA | G5 | S1 | PE | PE |
| LONICERA HIRSUTA | HAIRY HONEYSUCKLE | G4G5 | S1 | TU | PE |
| LONICERA OBLONGIFOLIA | SWAMP FLY HONEYSUCKLE | G4 | S1 | PE | PE |
| LONICERA VILLOSA | MOUNTAIN FLY HONEYSUCKLE | G5 | S1 | PE | PE |
| LUDWIGIA DECURRENS | UPRIGHT PRIMROSE-WILLOW | G5 | S1 | PE | PE |
| LUDWIGIA POLYCARPA | FALSE LOOSESTRIFE SEEDBOX | G4 | S1 | PE | PE |
| LUDWIGIA SPHAEROCARPA | SPHERICAL-FRUITED SEEDBOX | G5 | SX | PX | PX |
| LUPINUS PERENNIS | LUPINE | G5 | S3 | PR | PR |
| LUZULA BULBOSA | SOUTHERN WOOD-RUSH | G5 | S1 | TU | PE |
| LYCOPODIELLA ALOPECUROIDES | FOXTAIL CLUBMOSS | G5 | S1 | PE | PE |
| LYCOPODIELLA APPRESSA | SOUTHERN BOG CLUBMOSS | G5 | S2 | PT | PT |
| LYCOPODIELLA MARGUERITAE | A CLUBMOSS | G2 | SU | N | PE |
| LYCOPUS RUBELLUS | BUGLEWEED | G5 | S1 | PE | PE |
| LYGODIUM PALMATUM | HARTFORD FERN | G4 | S3 | PR | PR |
| LYONIA MARIANA | STAGGER-BUSH | G5 | S1 | PE | PE |
| LYSIMACHIA HYBRIDA | LANCE-LEAF LOOSESTRIFE | G5 | S1 | N | PT |
| LYSIMACHIA QUADRIFLORA | FOUR-FLOWERED LOOSESTRIFE | G5? | SX | TU | TU |
| LYTHRUM ALATUM | WINGED-LOOSESTRIFE | G5 | S1 | TU | PE |
| MAGNOLIA TRIPETALA | UMBRELLA MAGNOLIA | G5 | S2 | PT | PR |
| MAGNOLIA VIRGINIANA | SWEET BAY MAGNOLIA | G5 | S2 | PT | PT |
| MALAXIS BAYARDII | BAYARD'S MALAXIS | G2 | S1 | PR | PE |
| MALAXIS MONOPHYLLOS VAR | WHITE ADDER'S-MOUTH | G4Q | S1 | TU | PE |

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| MARSHALLIA GRANDIFLORA | LARGE-FLOWERED MARSHALLIA | G2 | S1 | PE | PE |
| MATELEA OBLIQUA | OBLIQUE MILKVINE | G47 | S1 | PE | PE |
| MEEHANIA CORDATA | HEARTLEAF MEEHANIA | G5 | S1 | TU | PE |
| MEGALODONTA BECKII | BECK'S WATER-MARIGOLD | G4G5 | S1 | PE | PE |
| MELANTHIUM VIRGINICUM | VIRGINIA BUNCHFLOWER | G5 | SU | N | TU |
| MELICA NITENS | THREE-FLOWERED MELIC-GRASS | G5 | S2 | PT | PT |
| MENZIESIA PILOSA | MINNIEBUSH | G4G5 | S3 | PR | PR |
| MICRANTHEMUM | NUTTALL'S MUD-FLOWER | GH | SX | PX | PX |
| MICRANTHEMOIDES | | | | | |
| MINUARTIA GLABRA | APPALACHIAN SANDWORT | G4 | S2 | PT | PT |
| MITELLA NUDA | NAKED BISHOP'S-CAP | G5 | S1 | PE | PE |
| MONARDA PUNCTATA | SPOTTED BEE-BALM | G5 | SH | PE | PE |
| MONTIA CHAMISSOI | CHAMISSO'S MINER'S-LETTUCE | G5 | S1 | PE | PE |
| MUHLENBERGIA CAPILLARIS | SHORT MUHLY | G5 | SX | PX | PX |
| MUHLENBERGIA CUSPIDATA | PLAINS MUHLENBERGIA | G4 | SE | TU | TU |
| MUHLENBERGIA UNIFLORA | FALL DROPSEED MUHLY | G5 | S2 | PE | PT |
| MYRICA GALE | SWEET-GALE | G5 | S2 | PT | PT |
| MYRIOPHYLLUM FARWELLII | FARWELL'S WATER-MILFOIL | G5 | S1 | PE | PE |
| MYRIOPHYLLUM | | | | | |
| HETEROPHYLLUM | BROAD-LEAVED WATER-MILFOIL | G5 | S1 | PE | PE |
| MYRIOPHYLLUM SIBIRICUM | NORTHERN WATER-MILFOIL | G5 | S1 | PE | PE |
| MYRIOPHYLLUM TENELLUM | SLENDER WATER-MILFOIL | G5 | S2 | PT | PT |
| MYRIOPHYLLUM VERTICILLATUM | WHORLED WATER-MILFOIL | G5 | S1 | PE | PE |
| NAJAS GRACILLIMA | BUSHY NAIAD | G57 | S2 | PT | PT |
| NAJAS MARINA | HOLLY-LEAVED NAIAD | G5 | S1 | PE | PE |
| NELUMBO LUTEA | AMERICAN LOTUS | G4 | S1 | PE | PE |
| NUPHAR LUTEA SSP PUMILA | YELLOW COWLILY | G5T4T5 | SU | TU | TU |
| NYMPHOIDES CORDATA | FLOATING-HEART | G5 | S2 | PT | PT |
| OENOTHERA ARGILLICOLA | SHALE-BARREN EVENING-PRIMROSE | G3G4 | S2 | PT | PT |
| OENOTHERA OAKESIANA | EVENING-PRIMROSE | G4G5Q | S2 | N | TU |
| ONOSMODIUM MOLLE VAR HISPIDISSIMUM | FALSE GROMWELL | G4G5T4 | S1 | PE | PE |
| ONOSMODIUM VIRGINIANUM | VIRGINIA FALSE-GROMWELL | G4 | SH | PX | PX |
| OPHIOGLOSSUM ENGELMANNII | LIMESTONE ADDER'S-TONGUE | G5 | S1 | PE | PE |
| OPHIOGLOSSUM VULGATUM | ADDER'S TONGUE | G5 | S1 | PX | PE |
| OPUNTIA HUMIFUSA | PRICKLY-PEAR CACTUS | G5 | S3 | PR | PR |
| ORYZOPSIS PUNGENS | SLENDER MOUNTAIN-RICEGRASS | G5 | S2 | PE | PE |
| OXYDENDRUM ARBOREUM | SOURWOOD | G5 | S3S4 | TU | PT |
| OXYPOLIS RIGIDIOR | STIFF COWBANE | G5 | S2 | TU | PT |
| PANICUM AMARUM VAR AMARULUM | SOUTHERN SEA-BEACH PANIC-GRASS | G5TU | SH | PE | PE |
| PANICUM ANNULUM | SERPENTINE PANIC-GRASS | G5T7 | S2 | TU | PT |
| PANICUM BICKNELLII | BICKNELL'S PANIC GRASS | G47Q | SU | TU | TU |
| PANICUM BOREALE | PANIC-GRASS | G5 | SU | TU | TU |
| PANICUM COMMONSIANUM VAR COMMONSIANUM | COMMONS' PANIC-GRASS | G5T5 | SH | TU | PX |
| PANICUM COMMONSIANUM VAR EUCHLAMYDEUM | CLOAKED PANIC-GRASS | G5T5 | S2 | PR | PE |
| PANICUM FLEXILE | WIRY WITCHGRASS | G5 | S2S3 | TU | TU |
| PANICUM LAXIFLORUM | LAX-FLOWER WITCHGRASS | G5 | S7 | N | PE |
| PANICUM LEIBERGHII | LEIBERG'S PANIC-GRASS | G5 | SX | PX | PX |
| PANICUM LONGIFOLIUM | LONG-LEAF PANIC-GRASS | G4 | SH | TU | PE |
| PANICUM LUCIDUM | SHINING PANIC-GRASS | G7Q | S1 | TU | PE |
| PANICUM OLIGOSANTHES | HELLER'S WITCHGRASS | G5 | S3 | N | TU |
| PANICUM RECOGNITUM | FERNALD'S PANIC-GRASS | G4 | SH | TU | TU |
| PANICUM SCOPARIUM | VELVETY PANIC-GRASS | G5 | S1 | PE | PE |
| PANICUM SPRETUM | EATON'S WITCHGRASS | G5 | SH | PX | PE |
| PANICUM TUCKERMANII | TUCKERMAN'S PANIC-GRASS | G3G5 | S2 | PT | PT |
| PANICUM VILLOSISSIMUM VAR VILLOSISSIMUM | LONG-HAIRED PANIC-GRASS | G5T5 | SH | TU | TU |
| PANICUM XANTHOPHYSUM | SLENDER PANIC-GRASS | G5 | S1 | PE | PE |
| PANICUM YADKINENSE | YADKIN RIVER PANIC-GRASS | G47Q | S2 | TU | TU |
| PARNASSIA GLAUCA | CAROLINA GRASS-OF-PARNASSUS | G5 | S2 | PE | PE |
| PARONYCHIA FASTIGIATA VAR NUTTALLII | FORKED-CHICKWEED | G5T3T5 | S1S2 | TU | PE |
| PARTHENIUM INTEGRIFOLIUM | AMERICAN FEVER-FEW | G5 | SH | TU | PX |
| PASSIFLORA LUTEA | PASSION-FLOWER | G5 | S1 | PE | PE |
| PAXISTIMA CANBYI | CANBY'S MOUNTAIN-LOVER | G2 | S1 | PE | PE |
| PEDICULARIS LANCEOLATA | SWAMP LOUSEWORT | G5 | S1S2 | N | PE |
| PENSTEMON CANESCENS | BEARD-TONGUE | G4 | S3 | N | TU |
| PENSTEMON LAEVIGATUS | BEARD-TONGUE | G5 | S3 | N | TU |
| PHASEOLUS POLYSTACHIOS | WILD KIDNEY BEAN | G4 | S1S2 | N | TU |
| PHEMERANTHUS TERETIFOLIUS | ROUND-LEAVED FAME-FLOWER | G4 | S2 | PT | PT |
| PHLOX OVATA | MOUNTAIN PHLOX | G4 | S1 | PE | PE |
| PHLOX PILOSA | DOWNY PHLOX | G5 | S1S2 | TU | PE |
| PHLOX SUBULATA SSP BRITTONII | MOSS PINK | G5T4? | S1 | PE | PE |
| PHORADENDRON LEUCARPUM | CHRISTMAS MISTLETOE | G5 | SX | PX | PX |
| PHYLA LANCEOLATA | LANCE FOG-FRUIT | G5 | S2 | TU | PR |
| PHYLLANTHUS CAROLINIENSIS | CAROLINA LEAF-FLOWER | G5 | S1 | PE | PE |

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| PHYSALIS VIRGINIANA | VIRGINIA GROUND-CHERRY | G5 | S1S2 | TU | PE |
| PINUS ECHINATA | SHORT-LEAF PINE | G5 | S1S2 | N | TU |
| PIPTOCHAETIUM AVENACEUM | BLACKSEED NEEDLEGRASS | G5 | S1 | N | PE |
| PLATANThERA BLEPHARIGLOTTIS | WHITE FRINGED-ORCHID | G4G5 | S2S3 | N | TU |
| PLATANThERA CILIARIS | YELLOW-FRINGED ORCHID | G5 | S2 | TU | PT |
| PLATANThERA CRISTATA | CRESTED YELLOW ORCHID | G5 | SX | PX | PX |
| PLATANThERA DILATATA | LEAFY WHITE ORCHID | G5 | S1 | PE | PE |
| PLATANThERA HOOKERI | HOOKER'S ORCHID | G5 | S1 | TU | PE |
| PLATANThERA HYPERBOREA | LEAFY NORTHERN GREEN ORCHID | G5 | S1 | PE | PE |
| PLATANThERA LEUCOPHAEA | PRAIRIE WHITE-FRINGED ORCHID | G2 | SX | PX | PX |
| PLATANThERA PERAMOENA | PURPLE-FRINGELESS ORCHID | G5 | S2 | TU | PT |
| PLUCHEA ODORATA | SHRUBBY CAMPHOR-WEED | G5 | S1 | TU | PE |
| POA AUTUMNALIS | AUTUMN BLUEGRASS | G5 | S1 | PE | PE |
| POA LANGUIDA | DROOPING BLUEGRASS | G3G4Q | S2 | TU | PT |
| POA PALUDIGENA | BOG BLUEGRASS | G3 | S3 | PT | PR |
| POLEMONIUM VANBRUNTIAE | JACOB'S-LADDER | G3 | S1 | PE | PE |
| POLYGALA CRUCIATA | CROSS-LEAVED MILKWORT | G5 | S1 | PE | PE |
| POLYGALA CURTISSII | CURTIS'S MILKWORT | G5 | S1 | PE | PE |
| POLYGALA INCARNATA | PINK MILKWORT | G5 | SH | PE | PE |
| POLYGALA LUTEA | YELLOW MILKWORT | G5 | SX | PX | PX |
| POLYGALA NUTTALLII | NUTTALL'S MILKWORT | G5 | S3 | N | TU |
| POLYGALA POLYGAMA | RACEMED MILKWORT | G5 | S1S2 | TU | PE |
| POLYGONELLA ARTICULATA | EASTERN JOINTWEED | G5 | S1 | TU | PE |
| POLYGONUM AMPHIBIUM VAR STIPULACEUM | A WATER SMARTWEED | G5T5 | S2 | TU | TU |
| POLYGONUM CAREYI | CAREY'S SMARTWEED | G4 | S1 | PE | PE |
| POLYGONUM RAMOSISSIMUM | BUSHY KNOTWEED | G5 | SH | TU | PX |
| POLYGONUM SETACEUM VAR INTERJECTUM | A SWAMP SMARTWEED | G5T4 | S2 | PE | PE |
| POLYMNIA UVEDALIA | LEAF-CUP | G4G5 | SR | N | PT |
| POLYSTICHUM BRAUNII | BRAUN'S HOLLY FERN | G5 | S1 | PE | PE |
| POPULUS BALSAMIFERA | BALSAM POPLAR | G5 | S1 | PE | PE |
| POPULUS HETEROPHYLLA | SWAMP COTTONWOOD | G5 | SH | PX | PX |
| POTAMOGETON BICUPULATUS | PONDWEED | G4? | S2 | N | TU |
| POTAMOGETON CONFEROIDES | TUCKERMAN'S PONDWEED | G4 | S2 | PT | PT |
| POTAMOGETON FILIFORMIS | SLENDER PONDWEED | G5 | SH | TU | PX |
| POTAMOGETON FRIESII | FRIES' PONDWEED | G4 | S1 | PE | PE |
| POTAMOGETON GRAMINEUS | GRASSY PONDWEED | G5 | SH | PE | PE |
| POTAMOGETON HILLII | HILL'S PONDWEED | G3 | S1 | PE | PE |
| POTAMOGETON ILLINOENSIS | ILLINOIS PONDWEED | G5 | S3S4 | TU | PR |
| POTAMOGETON OAKESIANUS | OAKES' PONDWEED | G4 | S1S2 | TU | PE |
| POTAMOGETON OBTUSIFOLIUS | BLUNT-LEAVED PONDWEED | G5 | S1 | PE | PE |
| POTAMOGETON PRAELONGUS | WHITE-STEMMED PONDWEED | G5 | SH | PX | PE |
| POTAMOGETON PULCHER | SPOTTED PONDWEED | G5 | S1 | PE | PE |
| POTAMOGETON RICHARDSONII | RED-HEAD PONDWEED | G5 | S3 | PT | PR |
| POTAMOGETON STRICTIFOLIUS | NARROW-LEAVED PONDWEED | G5 | SH | PE | PE |
| POTAMOGETON TENNESSEENSIS | TENNESSEE PONDWEED | G2 | S1 | PE | PE |
| POTAMOGETON VASEYI | VASEY'S PONDWEED | G4 | S1 | PE | PE |
| POTAMOGETON ZOSTERIFORMIS | FLAT-STEM PONDWEED | G5 | S2S3 | PR | PR |
| POTENTILLA ANSERINA | SILVERWEED | G5 | S3 | PT | PR |
| POTENTILLA FRUTICOSA | SHRUBBY CINQUEFOIL | G5 | S1 | PE | PE |
| POTENTILLA PARADOXA | BUSHY CINQUEFOIL | G5 | S1 | PE | PE |
| POTENTILLA TRIDENTATA | THREE-TOOTHED CINQUEFOIL | G5 | S1 | PE | PE |
| PRENANTHES RACEMOSA | GLAUCOUS RATTLESNAKE-ROOT | G5 | SR | PX | PX |
| PRENANTHES SERPENTARIA | LION'S-FOOT | G5 | S3 | N | TU |
| PROSERPINACA PECTINATA | COMB-LEAVED MERMAID-WEED | G5 | SX | PX | PX |
| PRUNUS ALLEGHANIENSIS | ALLEGHANY PLUM | G4 | S2S3 | N | PT |
| PRUNUS MARITIMA | BEACH PLUM | G4 | S1 | PE | PE |
| PRUNUS PUMILA VAR DEPRESSA | | G5T5 | S1 | | PE |
| PRUNUS PUMILA VAR PUMILA | | G5T4 | SX | | PX |
| PRUNUS PUMILA VAR SUSQUEHANAE | | G5T4 | S2 | | PT |
| PTELEA TRIFOLIATA | COMMON HOP-TREE | G5 | S2 | PT | PT |
| PTILINIUM CAPILLACEUM | MOCK BISHOP-WEED | G5 | SX | PE | PX |
| PYCNANTHEMUM | MOUNTAIN-MINT | G2 | S1S2 | N | TUEF |
| CLINOPODIOIDES | | | | | |
| PYCNANTHEMUM TORREI | TORREY'S MOUNTAIN-MINT | G2 | SU | PE | PE |
| PYCNANTHEMUM VERTICILLATUM VAR PILOSUM | HAIRY MOUNTAIN-MINT | G5T5 | SU | TU | PX |
| PYROLA CHLORANTHA | | G5 | S1 | N | TU |
| PYRULARIA PUBERA | BUFFALO-NUT | G5 | S3 | PR | PR |
| QUERCUS FALCATA | SOUTHERN RED OAK | G5 | S1 | PE | PE |
| QUERCUS PHELLOS | WILLOW OAK | G5 | S2 | PE | PE |
| QUERCUS SHUMARDII | SHUMARD'S OAK | G5 | S1 | PE | PE |
| RANUNCULUS AMBIGENS | | G4 | S3 | N | TURF |
| RANUNCULUS AQUATILIS VAR DIFFUSUS | WHITE WATER-CROWFOOT | G5T5 | S3 | | PR |
| RANUNCULUS FASCICULARIS | TUFTED BUTTERCUP | G5 | S1S2 | PE | PE |
| RANUNCULUS FLABELLARIIS | YELLOW WATER-CROWFOOT | G5 | S2 | N | PT |
| RANUNCULUS FLAMMULA | LESSER SPEARWORT | G5 | SH | TU | PX |

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| RANUNCULUS PUSILLUS | SPEARWORT | G5 | S1 | N | PE |
| RATIBIDA PINNATA | GRAY-HEADED PRAIRIE CONEFLOWER | G5 | SA7 | TU | PX |
| RHAMNUS LANCEOLATA | LANCE-LEAVED BUCKTHORN | G5 | S1 | PE | PE |
| RHEXIA MARIANA | MARYLAND MEADOW-BEAUTY | G5 | S1 | PE | PE |
| RHODODENDRON ATLANTICUM | DWARF AZALEA | G4G5 | S1 | PE | PE |
| CALENDULACEUM | FLAME AZALEA | G5 | SX | PX | PX |
| RHYNCHOSPORA CAPILLACEA | CAPILLARY BEAKED-RUSH | G5 | S1 | PE | PE |
| RHYNCHOSPORA FUSCA | BROWN BEAKED-RUSH | G4G5 | SX | PX | PX |
| RHYNCHOSPORA GLOBULARIS | SMALL GLOBE BEAKED-RUSH | G5 | S1 | TU | PE |
| RHYNCHOSPORA GRACILENTA | BEAKED-RUSH | G5 | SX | PX | PX |
| RIBES LACUSTRE | SWAMP CURRANT | G5 | S1 | TU | PE |
| RIBES MISSOURIENSE | MISSOURI GOOSEBERRY | G5 | S1 | PE | PE |
| RIBES TRISTE | RED CURRANT | G5 | S2 | PT | PT |
| ROSA BLANDA | | G5 | SU | N | TUTFN |
| ROSA SETIGERA | | G5 | SU | N | TUEN |
| ROSA VIRGINIANA | VIRGINIA ROSE | G5 | S1 | TU | TU |
| RODALA RAMOSIOR | TOOTH-CUP | G5 | S3 | PR | PR |
| RUBUS CUNEIFOLIUS | SAND BLACKBERRY | G5 | S1 | TU | PE |
| RUBUS SETOSUS | SMALL BRISTLEBERRY | G5 | SH | TU | TU |
| RUDBECKIA FULGIDA | EASTERN CONEFLOWER | G5 | S3 | N | TU |
| RUPELLIA CAROLINIENSIS | CAROLINA PETUNIA | G5 | SX | PX | PX |
| RUPELLIA HUMILIS | FRINGED-LEAVED PETUNIA | G5 | S1 | PE | PE |
| RUPELLIA PEDUNCULATA | STALKED WILD-PETUNIA | G5 | S1 | N | TU |
| RUPELLIA STREPENS | LIMESTONE PETUNIA | G4G5 | S2 | PT | PT |
| RUMEX HASTATULUS | HEART-WINGED SORRELL | G5 | SX | TU | PX |
| SABATIA CAMPANULATA | SLENDER MARSH PINK | G5 | SX | PX | PX |
| SAGITTARIA CALYGINA VAR SPONGIOSA | LONG-LOBED ARROW-HEAD | G5T4 | S1 | PE | PE |
| SAGITTARIA FILIFORMIS | AN ARROW-HEAD | G4G5 | SX | PX | PX |
| SAGITTARIA SUBULATA | SUBULATE ARROWHEAD | G4 | S3 | PR | PR |
| SALIX CANDIDA | HOARY WILLOW | G5 | S1 | PT | PE |
| SALIX CAROLINIANA | CAROLINA WILLOW | G5 | S1 | N | PE |
| SALIX MYRICOIDES | BROAD-LEAVED WILLOW | G4 | S2 | N | TU |
| SALIX PEDICELLARIS | BOG WILLOW | G5 | S1 | N | PE |
| SALIX SERISSIMA | AUTUMN WILLOW | G4 | S2 | PT | PT |
| SALIX X SUBSERICEA | MEADOW WILLOW | G5 | S1 | TU | PE |
| SAMOLUS PARVIFLORUS | PINELAND PIMPERNEL | G5 | S2 | TU | PE |
| SCHEUCHZERIA PALUSTRIS | POD-GRASS | G5 | S1 | PE | PE |
| SCHIZACHYRIUM SCOPARIUM VAR LITTORALE | SEASIDE BLUESTEM | G5T? | S3 | PR | FR |
| SCHOENOPECTUS ACUTUS | HARD-STEMMED BULRUSH | G5 | S2 | PE | PE |
| SCHOENOPECTUS FLUVIATILIS | RIVER BULRUSH | G5 | S3 | PR | PR |
| SCHOENOPECTUS HETEROCHAETUS | SLENDER BULRUSH | G5 | SX | PX | PX |
| SCHOENOPECTUS SMITHII | SMITH'S BULRUSH | G5? | S1 | PE | PE |
| SCHOENOPECTUS SUBTERMINALIS | WATER BULRUSH | G4G5 | S3 | N | PT |
| SCHOENOPECTUS TORREYI | TORREY'S BULRUSH | G5? | S1 | PE | PE |
| SCIRPUS ANCISTROCHAETUS | NORTHEASTERN BULRUSH | G3 | S3 | PE | PT |
| SCIRPUS PEDICELLATUS | STALKED BULRUSH | G4 | S1 | PT | PT |
| SCLERIA MINOR | MINOR NUTRUSH | G4 | SH | PE | PE |
| SCLERIA MUEHLENBERGII | RETICULATED NUTRUSH | G5 | S1 | PE | PE |
| SCLERIA PAUCIFLORA | FEW FLOWERED NUTRUSH | G5 | S2 | PT | PT |
| SCLERIA TRIGLOMERATA | WHIP NUTRUSH | G5 | SH | TU | TU |
| SCLERIA VERTICILLATA | WHORLED NUTRUSH | G5 | S1 | PE | PE |
| SCUTELLARIA SAXATILIS | ROCK SKULLCAP | G3 | S1 | TU | PE |
| SCUTELLARIA SERRATA | SHOWY SKULLCAP | G4G5 | S1 | PX | PE |
| SEDUM ROSEA | ROSEROOT STONECROP | G5 | S1 | PE | PE |
| SEDUM TELEPHIOIDES | ALLEGHENY STONECROP | G4 | S3 | PR | PR |
| SENECIO ANONYMUS | PLAIN RAGWORT | G5 | S2 | PR | PR |
| SENECIO ANTENNARIIFOLIUS | CAT'S-PAW RAGWORT | G4 | S1 | PE | PE |
| SENECIO PLATTENSIS | PRAIRIE RAGWORT | G5 | SH | TU | PX |
| SENNA MARILANDICA | WILD SENNA | G5 | S1 | TU | PE |
| SHEPHERDIA CANADENSIS | CANADA BUFFALO-BERRY | G5 | S1 | PE | PE |
| SIDA HERMAPHRODITA | SIDA | G2 | S2 | PE | PE |
| SISYRINCHIUM ALBIDUM | BLUE-EYED GRASS | G5? | SH | TU | PX |
| SISYRINCHIUM ATLANTICUM | EASTERN BLUE-EYED GRASS | G5 | S1 | PE | PE |
| SISYRINCHIUM FUSCUM | SAND BLUE-EYED GRASS | G5? | SH | PX | PX |
| SMILAX PSEUDOCHINA | LONG-STALKED GREENBRIER | G4G5 | SH | PX | PX |
| SOLIDAGO ARGUTA VAR HARRISII | HARRIS' GOLDEN-ROD | G5T4 | S1 | PE | PE |
| SOLIDAGO CURTISII | CURTIS' GOLDEN-ROD | G4G5 | S1 | PE | PE |
| SOLIDAGO PURSHII | PURSH'S GOLDEN-ROD | G5 | SH | TU | TU |
| SOLIDAGO RIGIDA | HARD-LEAVED GOLDENROD | G5 | S1 | TU | PE |
| SOLIDAGO ROANENSIS | TENNESSEE GOLDEN-ROD | G4G5 | S2 | PR | PR |
| SOLIDAGO SIMPLEX SSP RANDII VAR RACEMOSA | STICKY GOLDEN-ROD | G5T4? | S1 | PE | PE |
| SOLIDAGO SPECIOSA VAR ERECTA | SLENDER GOLDEN-ROD | G5 | S1 | PE | PE |
| SOLIDAGO SPECIOSA VAR | | | | | |

| | | | | | |
|-----------------------------|----------------------------|--------|------|----|----|
| SPECIOSA | | | | | |
| SOLIDAGO ULIGINOSA | | | | | |
| SORBUS DECORA | | G4G5 | S3 | N | TU |
| SPARGANIUM ANDROCLADUM | SHOWY MOUNTAIN-ASH | G4G5 | S1 | PE | PE |
| SPARGANIUM ANGUSTIFOLIUM | BRANCHING BUR-REED | G4G5 | SH | PE | PE |
| SPARGANIUM MINIMUM | BUR-REED | G5 | S2 | N | TU |
| SPIRAEA BETULIFOLIA | SMALL BUR-REED | G5 | SX | PX | PX |
| SPIRAEA VIRGINIANA | DWARF SPIRAEA | G4G5 | S1 | PT | PE |
| SPIRANTHES CASEI | VIRGINIA SPIRAEA | G2 | SX | PX | PX |
| SPIRANTHES LUCIDA | CASE'S LADIES'-TRESSES | G4 | S1 | PE | PE |
| SPIRANTHES MAGNICAMPORUM | SHINING LADIES'-TRESSES | G5 | S3 | N | TU |
| SPIRANTHES OVALIS | LADIES'-TRESSES | G4 | SX | PX | PX |
| SPIRANTHES ROMANZOFFIANA | OCTOBER LADIES'-TRESSES | G57 | S1 | PE | PE |
| SPIRANTHES TUBEROSA | HOODED LADIES'-TRESSES | G5 | S1 | PE | PE |
| SPIRANTHES VERNALIS | LITTLE LADIES'-TRESSES | G5 | S1 | TU | PE |
| SPIRODELA PUNCTATA | SPRING LADIES'-TRESSES | G5 | S1 | PE | PE |
| SPOROBOLUS CLANDESTINUS | EASTERN WATER-FLAXSEED | G5 | SH | TU | TU |
| SPOROBOLUS HETEROLEPIS | ROUGH DROPSEED | G5 | S1 | PE | PE |
| STACHYS HYSSOPIFOLIA | PRAIRIE DROPSEED | G5 | S1 | PE | PE |
| STACHYS NUTTALLII | HYSSOP HEDGE-NETTLE | G5 | SH | TU | PX |
| STELLARIA BOREALIS | NUTTALL'S HEDGE-NETTLE | G57 | S1 | PE | PE |
| STENANTHIUM GRAMINEUM | MOUNTAIN STARWORT | G5 | S1S2 | N | TU |
| STIPA SPARTEA | FEATHERBELLS | G4G5 | S1S2 | N | TU |
| STREPTOPUS AMPLEXIFOLIUS | NEEDLE-GRASS | G5 | SH | N | TU |
| STROPHOSTYLES UMBELLATA | WHITE TWISTED-STALK | G5 | S1 | PE | PE |
| STYLOSANTHES BIFLORA | WILD BEAN | G5 | S2 | N | PE |
| SWERTIA CAROLINIENSIS | PENCILFLOWER | G5 | S2 | TU | PE |
| TAENIDIA MONTANA | AMERICAN COLUMBO | G5 | S1 | PE | PE |
| THALICTRUM CORIACEUM | MOUNTAIN PIMPERNEL | G4 | S1 | PE | PE |
| THALICTRUM DASycARPUM | THICK-LEAVED MEADOW-RUE | G4 | S2 | PE | PT |
| TIPULARIA DISCOLOR | PURPLE MEADOW-RUE | G5 | S1 | N | TU |
| TOXICODENDRON RYDBERGII | CRANEFLY ORCHID | G4G5 | S3 | PR | PR |
| TRAUTVETTERIA CAROLINIENSIS | GIANT POISON-IVY | G5 | S1 | N | PE |
| TRICHOSTEMA SETACEUM | CAROLINA TASSEL-RUE | G5 | S3 | PR | PR |
| TRIFOLIUM REFLEXUM | BLUE-CURLS | G5 | S1 | PE | PE |
| TRIFOLIUM VIRGINICUM | BUFFALO CLOVER | G5 | SX | PX | PX |
| TRIGLOCHIN PALUSTRE | KATE'S MOUNTAIN CLOVER | G3 | S1 | PE | PE |
| TRILLIUM CERNUUM | MARSH ARROWGRASS | G5 | SX | PX | PX |
| TRILLIUM FLEXIPES | | G5 | S3 | N | TU |
| TRILLIUM NIVALE | DECLINED TRILLIUM | G5 | S2 | TU | TU |
| TRIOSTEUM ANGUSTIFOLIUM | SNOW TRILLIUM | G4 | S3 | PR | PR |
| TRIPHORA TRIANTHOPHORA | HORSE-GENTIAN | G5 | S1 | TU | PE |
| TRIFLISIS PURPUREA | NODDING POGONIA | G3G4 | SH | PE | PE |
| TRIPSACLIUM DACTYLOIDES | PURPLE SANDGRASS | G4G5 | S1 | PE | PE |
| TRISETUM SPICATUM | EASTERN GAMMA-GRASS | G5 | S1 | TU | PE |
| TROLLIUS LAXUS SENSU | NARROW FALSE OATS | G5 | S1 | N | PE |
| STRICTO | | G3Q | S1 | PE | PE |
| UTRICULARIA CORNUTA | HORNED BLADDERWORT | G5 | S2 | N | PT |
| UTRICULARIA GEMINISCAPA | BLADDERWORT | G4G5 | S3 | N | TU |
| UTRICULARIA INFLATA | FLOATING BLADDERWORT | G5 | S1S2 | N | TU |
| UTRICULARIA INTERMEDIA | FLAT-LEAVED BLADDERWORT | G5 | S2 | PT | PT |
| UTRICULARIA MINOR | LESSER BLADDERWORT | G5 | S2S3 | PT | PT |
| UTRICULARIA RADIATA | SMALL SWOLLEN BLADDERWORT | G4 | SX | PE | PX |
| UTRICULARIA RESUPINATA | NORTHEASTERN BLADDERWORT | G4 | SX | PX | PX |
| UTRICULARIA SUBULATA | | G5 | SX | N | PX |
| UVULARIA PUDICA | MOUNTAIN BELLWORT | G5 | SH | TU | PR |
| VERNONIA GLAUCA | TAWNY IRONWEED | G5 | S1 | PE | PE |
| VERONICA CATENATA | PENNELLS SPEEDWELL | G5 | S1 | TU | TU |
| VIBURNUM NUDUM | POSSUM-HAW | G5 | S1 | PE | PE |
| VIBURNUM TRILOBUM | HIGHBUSH-CRANBERRY | G5T5 | S3S4 | TU | PR |
| VIOLA APPALACHIENSIS | APPALACHIAN BLUE VIOLET | G3 | S2 | PT | TU |
| VIOLA BRITTONIANA | COAST VIOLET | G4G5 | S1 | PE | PE |
| VIOLA RENIFOLIA | KIDNEY-LEAVED WHITE VIOLET | G5 | SH | TU | PX |
| VIOLA SELKIRKII | GREAT-SPURRED VIOLET | G57 | S1 | N | TU |
| VIOLA TRIPARTITA | THREE-PARTED VIOLET | G5 | SH | TU | PX |
| VITIS CINEREA VAR BAILEYANA | A PIGEON GRAPE | G4G5T7 | SH | TU | PE |
| VITIS NOVAE-ANGLIAE | NEW ENGLAND GRAPE | G4G5Q | S1 | PE | PE |
| VITIS RUPESTRIS | SAND GRAPE | G3 | S1 | PX | PE |
| VITTARIA APPALACHIANA | APPALACHIAN GAMETOPHYTE | G4 | S2 | PT | PT |
| WOLFFIA BOREALIS | FERN | G5 | S1 | TU | TU |
| WOLFFIELLA GLADIATA | DOTTED WATER-MEAL | G5 | S2 | PR | PR |
| WOODWARDIA AREOLATA | BOG-MAT | G5 | S2 | N | PT |
| XYRIS MONTANA | NETTED CHAINFERN | G5 | S2 | N | PT |
| XYRIS TORTA | NORTHERN YELLOW-EYED GRASS | G4 | S3 | PR | PR |
| ZIGADENUS GLAUCUS | TWISTED YELLOW-EYED GRASS | G5 | S1 | N | PT |
| ZIZANIA AQUATICA | WHITE CAMAS | G4G5 | S1 | N | PE |
| | INDIAN WILD RICE | G5 | S3 | PR | PR |

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Vertebrates

Last Revised 8/11/02

8/15/2003

| Scientific Name | Common Name | Global Rank | State Rank | State Status | Proposed State Status | Federal Status |
|-------------------------|---------------------------|-------------|------------|--------------|-----------------------|-----------------|
| ACANTHARCHUS POMOTIS | MUD SUNFISH | G5 | SX | | PX | |
| ACCIPITER GENTILIS | NORTHERN GOSHAWK | G5 | S2S3B,S3N | | CR | |
| ACIPENSER BREVIROSTRUM | SHORTNOSE STURGEON | G3 | S1 | PE | PE | LE |
| ACIPENSER FULVESCENS | LAKE STURGEON | G3 | S1 | PE | PE | |
| ACIPENSER OXYRINCHUS | ATLANTIC STURGEON | G3 | S1 | PE | PE | (LT,C) |
| AEGOLIUS ACADICUS | NORTHERN SAW-WHET OWL | G5 | S3B,S3N | | CU | |
| AIMOPHILA AESTIVALIS | BACHMAN'S SPARROW | G3 | SX | | PX | |
| ALCES ALCES | MOOSE | G5 | SX | | PX | |
| ALOSA CHRYSOCHLORIS | SKIPJACK HERRING | G5 | SH? | PT | PT | |
| ALOSA MEDIOCRIS | HICKORY SHAD | G5 | SH? | PE | PE | |
| AMBYSTOMA TIGRINUM | TIGER SALAMANDER | G5 | SX | | PX | (PS) |
| AMEIURUS MELAS | BLACK BULLHEAD | G5 | S1? | PE | PE | |
| AMIA CALVA | BOWFIN | G5 | S2S3 | PC | CR | |
| AMMOCRYPTA PELLUCIDA | EASTERN SAND DARTER | G3 | S1 | PE | PE | |
| ANAS CRECCA | GREEN-WINGED TEAL | G5 | S1S2B,S3N | | CR | |
| ANEIDES AENEUS | GREEN SALAMANDER | G3G4 | S1 | PT | PT | |
| APALONE MUTICA | SMOOTH SOFTSHELL | G5 | SX | | PX | |
| APHREDODERUS SAYANUS | PIRATE PERCH | G5 | SX | | PX | |
| ARDEA HERODIAS | GREAT BLUE HERON | G5 | S3S4B,S4N | | | |
| ASIO FLAMMEUS | SHORT-EARED OWL | G5 | S1B,S3N | PE | PE | |
| ASIO OTUS | LONG-EARED OWL | G5 | S2B,S2S3N | | CU | |
| BARTRAMIA LONGICAUDA | UPLAND SANDPIPER | G5 | S1S2B | PT | PT | |
| BISON BISON | AMERICAN BISON | G4 | SX | | PX | (PS) |
| BOTAURUS LENTIGINOSUS | AMERICAN BITTERN | G4 | S1B | PE | PE | |
| CANIS LUPUS | GRAY WOLF | G4 | SX | | PX | (PS:LE,LT,XN) |
| CARPIODES CARPIO | RIVER CARPSUCKER | G5 | SR | | | |
| CARPIODES VELIFER | HIGHFIN CARPSUCKER | G4G5 | SX? | | | |
| CASMERODIUS ALBUS | GREAT EGRET | G5 | S1B | PE | PE | |
| CATHARUS USTULATUS | SWAINSON'S THRUSH | G5 | S2S3B,S5N | | CR | |
| CATOSTOMUS CATOSTOMUS | LONGNOSE SUCKER | G5 | S1 | PE | PE | |
| CERVUS ELAPHUS | WAPITI OR ELK | G5 | SXSC | | PX | (PS) |
| CHARADRIUS MELODUS | PIPING PLOVER | G3 | SX | | PX | (LE,LT) |
| CHLIDONIA NIGER | BLACK TERN | G4 | S1B | PE | PE | |
| CIRCUS CYANEUS | NORTHERN HARRIER | G5 | S3B,S4N | | CA | |
| CISTOTHORUS PALUSTRIS | MARSH WREN | G5 | S2S3B | | CR | |
| CISTOTHORUS PLATENSIS | SEDGE WREN | G5 | S1B | PT | PT | |
| CLEMMYS MUHLENBERGII | BOG TURTLE | G3 | S2 | PE | PE | (LT,T (S/A)) |
| CLONOPHIS KIRTLANDII | KIRTLAND'S SNAKE | G2 | SH | PE | PE | |
| COLINUS VIRGINIANUS | NORTHERN BOBWHITE | G5 | S2S3 | | CA | (PS) |
| CONTOPUS COOPERI | OLIVE-SIDED FLYCATCHER | G5 | SXB | | PX | |
| CONUROPSIS CAROLINENSIS | CAROLINA PARAKEET | GX | SX | | | |
| COREGONUS ARTEDI | CISCO | G5 | SH? | PE | PE | |
| COREGONUS CLUPEAFORMIS | LAKE WHITEFISH | G5 | SX | | PX | |
| COREGONUS ZENITHICUS | SHORTJAW CISCO | G2 | SX | | PX | |
| COTTUS RICEI | SPOONHEAD SCULPIN | G5 | SR | | PX | |
| CROTALUS HORRIDUS | TIMBER RATTLESNAKE | G4 | S3S4 | PC | CA | |
| CRYPTOTIS PARVA | LEAST SHREW | G5 | S1 | PE | PE | |
| CULAEA INCONSTANS | BROOK STICKLEBACK | G5 | S3 | PC | C | |
| CYCLEPTUS ELONGATUS | BLUE SUCKER | G3G4 | SR? | PC | CU | |
| CYSTOPHORA CRISTATA | HOODED SEAL | G4G5 | SA | | | |
| ECTOPISTES MIGRATORIUS | PASSENGER PIGEON | GX | SX | | PX | |
| EMPIDONAX FLAVIVENTRIS | YELLOW-BELLIED FLYCATCHER | G5 | S1S2B | PT | PT | |
| EMYDOIDEA BLANDINGII | BLANDING'S TURTLE | G4 | S1 | PC | PX | |
| ENNEACANTHUS CHAETODON | BLACKBANDED SUNFISH | G4 | SX | | PX | |
| ENNEACANTHUS OBESUS | BANDED SUNFISH | G5 | S2S3 | PE | PE | |
| ERIMYSTAX X-PUNCTATUS | GRAVEL CHUB | G4 | S1 | PE | PE | |
| ERIMYZON SUCETTA | LAKE CHUBSUCKER | G5 | SX | | PX | |
| ETHEOSTOMA CAMURUM | BLUEBREAST DARTER | G4 | S2 | PT | PT | |
| ETHEOSTOMA EXILE | IOWA DARTER | G5 | S1 | PE | PE | |
| ETHEOSTOMA FUSIFORME | SWAMP DARTER | G5 | SX | | PX | |
| ETHEOSTOMA MACULATUM | SPOTTED DARTER | G2 | S2 | PT | PT | |
| ETHEOSTOMA TIPPECANOE | TIPPECANOE DARTER | G3 | S2 | PT | PT | |
| EUMECE ANTHRACINUS | COAL SKINK | G5 | S3 | | | |
| EUMECE LATICEPS | BROADHEAD SKINK | G5 | S1 | PC | CR | |
| FALCO PEREGRINUS | PEREGRINE FALCON | G4 | S1B,S1N | PE | PE | |
| FELIS LYNX | LYNX | G5 | SX | | PX | (PS:LT) |
| FELIS RUFUS | BOBCAT | G5 | S3S4 | | CA | |
| FULICA AMERICANA | AMERICAN COOT | G5 | S3B,S3N | | CR | |
| GALLINAGO GALLINAGO | COMMON SNIFE | G5 | S3B,S3N | | CR | |
| GALLINULA CHLOROPUS | COMMON MOORHEN | G5 | S3B | | | (PS) |
| GASTEROSTEUS ACULEATUS | THREESPIKE STICKLEBACK | G5 | SA? | PE | PE | (PS) |

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|--------------------------|-----------------------------|-------|---------|----|----|----|-------------|
| GLAUCOMYS SABRINUS | NORTHERN FLYING SQUIRREL | G5 | SU | | | | (PS) |
| GULO GULO | WOLVERINE | G4 | SX | | | PX | |
| HALIAEETUS | BALD EAGLE | G4 | S2B | PE | PE | | (PS:LT,PDL) |
| LEUCOCEPHALUS | EASTERN HOGNOSE SNAKE | G5 | S3S4 | | | | |
| HETERODON PLATIRHINOS | GOLDEYE | G5 | S2? | PT | PT | | |
| HIODON ALOSIDES | MOONEYE | G5 | S2? | PT | PT | | |
| HIODON TERGISUS | OHIO LAMPREY | G3G4 | S2S3 | PC | C | | |
| ICHTHYOMYZON BDELLIUM | NORTHERN BROOK LAMPREY | G4 | S1 | PE | PE | | |
| ICHTHYOMYZON FOSSOR | MOUNTAIN BROOK LAMPREY | G3G4 | S2 | PT | PT | | |
| ICHTHYOMYZON GREELEYI | SILVER LAMPREY | G5 | SH | | | PX | |
| ICHTHYOMYZON UNICUSPIS | SMALLMOUTH BUFFALO | G5 | S2 | PT | PT | | |
| ICTIOBUS BUBALUS | BIGMOUTH BUFFALO | G5 | SX | PE | PE | | |
| ICTIOBUS CYPRINELLUS | LEAST BITTERN | G5 | S1B | PE | PE | | |
| IXOBRYCHUS EXILIS | EASTERN MUD TURTLE | G5 | SH | | | PX | |
| KINOSTERNON SUBRUBRUM | BROOK SILVERSIDE | G5 | S3 | PC | C | | |
| LABIDESTHES SICCOLUS | LEAST BROOK LAMPREY | G5 | S3 | CR | CR | | |
| LAMPETRA AEPYPTERA | AMERICAN BROOK LAMPREY | G4 | S3 | CR | CR | | |
| LAMPETRA APPENDIX | COMMON KINGSSNAKE | G5 | SX | | | | |
| LAMPROPELTIS GETULA | MIGRANT LOGGERHEAD SHRIKE | G5T3Q | S1B | PE | PE | | |
| LANIUS LUDOVICIANUS | SILVER-HAIRED BAT | G5 | SUB | | | CR | |
| MIGRANS | SPOTTED GAR | G5 | S1 | PE | PE | | |
| LASIONYCTERIS | LONGNOSE GAR | G5 | S2S3 | PC | CR | | |
| NOCTIVAGANS | WARMOUTH | G5 | S1S2 | PE | PE | | |
| LEPISOSTEUS OCVLATUS | LONGEAR SUNFISH | G5 | S1 | PE | PE | | |
| LEPISOSTEUS OSSEUS | NORTHERN RIVER OTTER | G5 | S3 | | | CA | |
| LEPOMIS GULOSUS | BURBOT | G5 | S1S2 | PE | PE | | |
| LEPOMIS MEGALOTIS | REDFIN SHINER | G5 | S2 | PE | PE | | |
| LONTRA CANADENSIS | SILVER CHUB | G5 | S1 | PE | PE | | |
| LOTA LOTA | AMERICAN MARTEN | G5 | SX | | | PX | |
| LYTHRURUS UMBRATILIS | FISHER | G5 | SC | | | CA | |
| MACRHYBOPSIS STORERIANAS | ROCK VOLE | G4 | S2 | | | PT | |
| MARTES AMERICANA | SPOTTED SUCKER | G5 | S2 | PT | PT | | |
| MARTES PENNANTI | RIVER REDHORSE | G4 | S3 | PC | CU | | |
| MICROTUS CHROTORRHINUS | LEAST WEASEL | G5 | S3 | | | CU | |
| MINYTREMA MELANOPS | EASTERN SMALL-FOOTED MYOTIS | G3 | S1B,S1N | PT | PT | | |
| MOXOSTOMA CARINATUM | NORTHERN MYOTIS | G4 | S3B,S3N | | | CR | |
| MUSTELA NIVALIS | INDIANA OR SOCIAL MYOTIS | G2 | SUB,S1N | PE | PE | LE | |
| MYOTIS LEIBII | DEEPWATER SCULPIN | G5 | SU | | | PX | |
| MYOTIS SEPTENTRIONALIS | ALLEGHENY WOODRAT | G3G4 | S3 | PT | PT | | |
| MYOTIS SODALIS | HORNHEAD CHUB | G5 | S2 | PC | CR | | |
| MYOXOCEPHALUS THOMPSONI | POPEYE SHINER | G3 | S1 | | | PX | |
| NEOTOMA MAGISTER | BRIDLE SHINER | G5 | S1S2 | PE | PE | | |
| NOCOMIS BIGUTTATUS | RIVER SHINER | G5 | S1? | PE | PE | | |
| NOTROPIS ARIOMMUS | GHOST SHINER | G5 | S1 | PE | PE | | |
| NOTROPIS BIFRENATUS | IRONCOLOR SHINER | G4 | S1 | PE | PE | | |
| NOTROPIS BLENNIUS | BIGMOUTH SHINER | G5 | S2 | PT | PT | | |
| NOTROPIS BUCHANANI | BLACKCHIN SHINER | G5 | S1 | PE | PE | | |
| NOTROPIS CHALYBAEUS | BLACKNOSE SHINER | G5 | SX | | | PX | |
| NOTROPIS DORSALIS | MOUNTAIN MADTOM | G4 | S1S2 | PE | PE | | |
| NOTROPIS HETERODON | TADPOLE MADTOM | G5 | S1 | PE | PE | | |
| NOTROPIS HETEROLEPIS | BRINDLED MADTOM | G5 | S2 | PT | PT | | |
| NOTURUS ELEUTHERUS | NORTHERN MADTOM | G3 | S2 | PE | PE | | |
| NOTURUS GYRINUS | YELLOW-CROWNED NIGHT-HERON | G5 | S1B | PE | PE | | |
| NOTURUS MIURUS | EVENING BAT | G5 | SUB,SUN | | | CR | |
| NOTURUS STIGMOSUS | BLACK-CROWNED NIGHT-HERON | G5 | S2S3B | | | CA | |
| NYCTANASSA VIOLACEA | ROUGH GREEN SNAKE | G5 | S1 | PT | PT | | |
| NYCTICEIUS HUMERALIS | PUGNOSE MINNOW | G5 | S1SE7 | | | | |
| NYCTICORAX NYCTICORAX | MARSH RICE RAT | G5 | SX | | | PX | (PS) |
| OPHEODRYS AESTIVUS | OSPREY | G5 | S2B | PT | PT | | |
| OPSOPOEODUS EMILIAE | CHEAT MINNOW | G1G2Q | S1? | | | CU | |
| ORYZOMYS PALUSTRIS | CHANNEL DARTER | G4 | S1S2 | PT | PT | | |
| PANDION HALIAETUS | GILT DARTER | G4 | S1S2 | PT | PT | | |
| PARARHINICHTHYS BOWERSI | LONGHEAD DARTER | G3 | S2 | PT | PT | | |
| PERCINA COPELANDI | SHARPNOSE DARTER | G4 | SX | | | PX | |
| PERCINA EVIDES | HARBOR SEAL | G5 | SA | | | | |
| PERCINA MACROCEPHALA | HARBOR PORPOISE | G4G5 | SA | | | | (PS:C) |
| PERCINA OXYRHYNCHUS | NORTHERN REDBELLY DACE | G5 | SX | | | PX | |
| PHOCA VITULINA | SOUTHERN REDBELLY DACE | G5 | S2S3 | PT | PT | | |
| PHOCOENA PHOCOENA | BULLHEAD MINNOW | G5 | SU | | | CU | |
| PHOXINUS EOS | SUMMER TANAGER | G5 | S3B | | | CR | |
| PHOXINUS ERYTHROGASTER | GLOSSY IBIS | G5 | SAB | | | | |
| PIMEPHALES VIGILAX | PIED-BILLED GREBE | G5 | S3B,S4N | | | CR | |
| PIRANGA RUBRA | PADDLEFISH | G4 | SXSC | | | PX | |
| PLEGADIS FALCINELLUS | | | | | | | |
| PODILYMBUS PODICEPS | | | | | | | |
| POLYODON SPATHULA | | | | | | | |

| | | | | | | | |
|-------------------------|----------------------------|----------|---------|----|----|---------|--|
| PROTONOTARIA CITREA | PROTHONOTARY WARBLER | G5 | S2S3B | | | CR | |
| PSEUDACRIS TRISERIATA | NEW JERSEY CHORUS FROG | G5T4 | S1 | PE | PE | | |
| KALMI | | | | | | | |
| PSEUDEMYS RUBRIVENTRIS | REDBELLY TURTLE | G5 | S2 | PT | CA | (PS) | |
| PSEUDOTRITON MONTANUS | MUD SALAMANDER | G5 | S1 | PE | CA | | |
| PUMA CONCOLOR COUGUAR | EASTERN COUGAR | G5TH | SX | | PX | LE | |
| RALLUS ELEGANS | KING RAIL | G4G5 | S1B | PE | PE | | |
| RALLUS LIMICOLA | VIRGINIA RAIL | G5 | S3B | | | | |
| RANA SPHENOCEPHALA | COASTAL PLAIN LEOPARD FROG | G5 | S2 | PE | PE | | |
| SALVELINUS NAMAYCUSH | LAKE TROUT | G5 | S7 | | | | |
| SCAPHIOPUS HOLBROOKII | EASTERN SPADEFOOT | G5 | S1S2 | | | | |
| SCAPHIRHYNCHUS | SHOVELNOSE STURGEON | G4 | SX | | | | |
| PLATORYNCHUS | | | | | | | |
| SCIURUS NIGER CINERELUS | DELMARVA FOX SQUIRREL | G5T3 | SX | PE | PX | (LE,XN) | |
| SCIURUS NIGER VULPINUS | EASTERN FOX SQUIRREL | G5T4T5 | SU | | CR | | |
| SISTRURUS CATENATUS | EASTERN MASSASAUGA | G3G4T3T4 | S1S2 | PE | PE | C | |
| CATENATUS | | | | | | | |
| SOREX DISPAR | LONG-TAILED OR ROCK SHREW | G4 | S3 | | | | |
| SOREX PALUSTRIS | WATER SHREW | G5T5 | S3 | | | | |
| ALBIBARBIS | | | | | | | |
| SOREX PALUSTRIS | SOUTHERN WATER SHREW | G5T3 | S1 | PT | PT | | |
| PUNCTULATUS | | | | | | | |
| SPILOGALE PUTORIUS | EASTERN SPOTTED SKUNK | G5 | SH | | PE | | |
| SPIZA AMERICANA | DICKCISSEL | G5 | S2B | | PT | | |
| STERNA HIRUNDO | COMMON TERN | G5 | SXB | PE | PE | | |
| STIZOSTEDION VITREUM | BLUE PIKE | G5TX | SX | | PX | | |
| GLAUCUM | | | | | | | |
| SYLVILAGUS OBSCURUS | APPALACHIAN COTTONTAIL | G4 | SU | | | | |
| TAXIDEA TAXUS | AMERICAN BADGER | G5 | SA | N | | | |
| THRYOMANES BEWICKII | APPALACHIAN BEWICK'S WREN | G5T2Q | SH | | PX | | |
| ALTUS | | | | | | | |
| TYMPANUCHUS CUPIDO | GREATER PRAIRIE-CHICKEN | G4 | SX | | PX | (PS) | |
| TYTO ALBA | BARN-OWL | G5 | S3B,S3N | | CA | | |
| UMBRA LIMI | CENTRAL MUDMINNOW | G5 | S3 | PC | C | | |
| UMBRA PYGMAEA | EASTERN MUDMINNOW | G5 | S3 | PC | C | | |

Invertebrates

Last Revised 6/11/02

8/15/2003

| Scientific Name | Common Name | Global Rank | State Rank | State Status | Proposed State Status | Federal Status |
|---------------------------------|------------------------------------|-------------|------------|--------------|-----------------------|----------------|
| ACRONICTA ALBARUFA | BARRENS DAGGER MOTH | G3G4 | SX | | | |
| ACRONICTA LANCEOLARIA | A NOCTUID MOTH | G4 | SU | | | |
| AESHNA CLEPSYDRA | SPOTTED BLUE DARNER | G4 | S2S3 | | | |
| AESHNA MUTATA | SPRING BLUE DARNER | G3G4 | S1 | | | |
| ALASMIDONTA HETERODON | DWARF WEDGEMUSSEL | G1G2 | S1 | | | |
| ALASMIDONTA VARICOSA | BROOK FLOATER | G3 | S2 | | PX | LE |
| AMBLEMA Plicata | THREE-RIDGE | G5 | S2S3 | | PE | |
| AMBLYSCIRTES VIALIS | ROADSIDE SKIPPER | G5 | S7 | | PT | |
| AMELETUS BROWNII | | G3 | S7 | | | |
| ANAX LONGIPES | LONG-LEGGED GREEN DARNER | G5 | S1S2 | | | |
| ANISOTA STIGMA | SPINY OAKWORM MOTH | G5 | S7 | | | |
| ANODONTA IMPLICATA | ALEWIFE FLOATER | G5 | SH | | CU | |
| ANODONTOIDES | | | | | | |
| FERUSSACIANUS | CYLINDRICAL PAPERSHELL | G5 | S2S3 | | PE | |
| ANOMOGYNA ELIMATA | SOUTHERN VARIABLE DART MOTH | G5 | SU | | | |
| APAMEA BURGESSII | A CUTWORM MOTH | G4 | SH | | | |
| APAMEA CRISTATA | A NOCTUID MOTH | G4 | SU | | | |
| APHARETRA PURPUREA | A NOCTUID MOTH | G4 | S2 | | | |
| APLECTOIDES CONDITA | A NOCTUID MOTH | G4 | S2S3 | | | |
| APODREPANULATRIX LIBERARIA | A GEOMETER MOTH | G4 | S3 | | | |
| ARCTOSA LITTORALIS | A SAND SPIDER | G7 | S? | N | | |
| ARGIA BIPUNCTULATA | TWO-SPOTTED DANCER | G4 | SU | | | |
| ARGIA FUMIPENNIS | VARIABLE DANCER | G5 | S7 | | | |
| ARGIA TIBIALIS | EASTERN DANCER | G5 | SH | | | |
| ARIGOMPHUS FURCIFER | FORKED CLUBTAIL DRAGONFLY | G5 | S2 | | | |
| ARTACE CRIBRARIA | DOT-LINED WHITE MOTH | G5 | S1 | | | |
| ATRYTONE AROGOS AROGOS | AROGOS SKIPPER | G3G4T1T2 | SX | | | |
| ATRYTONOPSIS HIANNA | DUSTED SKIPPER | G4G5 | S3 | | | |
| AUTOCHTON CELLUS | GOLDEN-BANDED SKIPPER | G4 | SH | | | |
| BAGISARA GULNARE | A NOCTUID MOTH | G4 | SU | | | |
| BAGISARA RECTIFASCIA | STRAIGHT LINED MALLOW MOTH | G4 | SU | | | |
| BOYERIA GRAFIANA | OCELLATED DARNER | G5 | S3 | | | |
| BRACHIONYCHA BOREALIS | BOREAL FAN MOTH | G4 | SH | | | |
| CAECIDOTEA FRANZI | FRANZ'S CAVE ISOPOD | G2G3 | S1 | | | |
| CAECIDOTEA KENKI | AN ISOPOD | G3 | S1 | | | |
| CAECIDOTEA PRICEI | PRICE'S CAVE ISOPOD | G3G4 | S2S3 | | | |
| CALEPHELIS BOREALIS | NORTHERN METALMARK | G3G4 | S2 | | | |
| CALOPTERYX AEQUABILIS | BLACK-BANDED BANDWING | G5 | S2 | | | |
| CALOPTERYX AMATA | SUPERB JEWELWING | G4 | S2S3 | | | |
| CALOPTERYX ANGUSTIPENNIS | APPALACHIAN JEWELWING | G4 | SU | | | |
| CALYCOPIIS CECROPIS | RED-BANDED HAIRSTREAK | G5 | S2S3 | | | |
| CARIPETA ARETARIA | SOUTHERN PINE LOOPER MOTH | G4 | S1 | | | |
| CARTEROCEPHALUS PALAEMON MANDAN | ARCTIC SKIPPER | G5T5 | S2 | | | |
| CATOCALA MARMORATA | MARbled UNDERWING MOTH | G3G4 | SX | | | |
| CATOCALA MIRANDA | A NOCTUID MOTH | G4 | SU | | | |
| CATOCALA PRETIOSA PRETIOSA | PRECIOUS UNDERWING MOTH | G4T2T3 | SX | | | |
| CATOCALA SP 1 | PINE WOODS UNDERWING | G5 | S1 | | | |
| CELASTRINA EBENINA | SOOTY AZURE | G4 | SH | | | |
| CELASTRINA NEGLECTAMAJOR | APPALACHIAN BLUE | G4 | S3S4 | | | |
| CERMA CORA | A BIRD-DROPPING MOTH | G3G4 | S? | | | |
| CHAETAGLAEA CERATA | A SALLOW MOTH | G3G4 | S1 | | | |
| CHAETAGLAEA TREMULA | BARRENS CHAETAGLAEA | G5 | S1 | | | |
| CHEUMATOPSYCHE HELMA | HELMA'S CHEUMATOPSYCHE CADDISFLY | G1G3 | S1 | | | |
| CHEUMATOPSYCHE VANNOTEI | VANNOTE'S CHEUMATOPSYCHE CADDISFLY | GH | SH | | | |
| CHLOSZYNE GORGONE | GORGONE CHECKERSPOT | G5 | SH | | | |
| CHLOSZYNE HARRISII | HARRIS' CHECKERSPOT | G4 | S3 | | | |
| CHYTONIX SENSILIS | MARVEL MOTH | G4 | S1 | | | |
| CICINDELA ANCOISCONENSIS | A TIGER BEETLE | G3 | S1 | | | |
| CICINDELA FORMOSA | A TIGER BEETLE | G5 | S1 | | | |
| CICINDELA HIRTICOLLIS | BEACH-DUNE TIGER BEETLE | G5 | S2S3 | | | |
| CICINDELA LEPIDA | LITTLE WHITE TIGER BEETLE | G4 | SH | | | |
| CICINDELA LIMBALIS | A TIGER BEETLE | G5 | S3 | | | |
| CICINDELA MARGINIPENNIS | COBBLESTONE TIGER BEETLE | G2G3 | SX | | | |
| CICINDELA PATRUCLA | A TIGER BEETLE | G3 | S2S3 | | | |
| CICINDELA SCUTELLARIS | A TIGER BEETLE | G5 | SH | | | |
| CICINDELA SPLENDIDA | A TIGER BEETLE | G5 | SH | | | |
| CICINDELA UNIPUNCTATA | A TIGER BEETLE | G4 | SH | | | |
| CICINNUS MELSHEIMERI | MELSHEIMER'S SACK BEARER | G4 | S1 | | | |
| CISTHENE PACKARDII | PACKARD'S LICHEN MOTH | G5 | S1S3 | | | |

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|------------------------------|----------------------------|--------|------|----|----|------|
| CISIMENE PLUMBEA | LEAD COLORED LICHEN MOTH | G5 | S1 | | | |
| CITHERONIA REGALIS | REGAL MOTH | G5 | SU | | | |
| CITHERONIA SEPULCRALIS | PINE DEVIL | G5 | SH | | | |
| CLOEON COGNATUM | | G3 | S7 | | | |
| COENAGRION RESOLUTUM | RESOLUTE DAMSEL | G5 | S1 | | | |
| COLEOPHORA | | | | | | |
| LEUCOCHRYSELLA | CHESTNUT CASE-BEARER MOTH | G7 | SX | | | |
| COLIAS INTERIOR | PINK-EDGED SULPHUR | G5 | SH | | | |
| CRAMBIDIA CEPHALICA | LICHEN MOTH | G4 | S1S2 | | | |
| CRAMBIDIA PURA | PURE LICHEN MOTH | G4 | SU | | | |
| CRANGONYX DEAROLFI | PENNSYLVANIA CAVE AMPHIPOD | G2G3 | S1 | | | |
| CYCLONAIAS TUBERCULATA | PURPLE WARTYBACK | G5 | SX | | PX | |
| CYCLOPHORA NANARIA | A GEOMETRID MOTH | G5 | S1S2 | | | |
| CYPROGENIA STEGARIA | FANSHELL | G1 | SX | | PX | LE |
| DACTYLOCYTHERE SUTERI | AN OSTRACOD | GU | SU | | | |
| DATANA RANAECEPS | A HAND-MAID MOTH | G3G4 | S1 | | | |
| DERRIMA STELLATA | PINK STAR MOTH | G4 | SH | | | |
| DIARSIA RUBIFERA | | G5 | SU | | | |
| DOROCORDULIA LEPIDA | ELEGANT SKIMMER | G5 | S2 | | | |
| DRYOBILUS SEXNOTATUS | SIX-BANDED LONGHORN BEETLE | G7 | SH | | | |
| ELAPHRIA FESTIVOIDES | A NOCTUID MOTH | G5 | S5 | | | |
| ELAPHRIA GEORGEI | A MIDGET MOTH | G4 | S? | | | |
| ELAPHRIA SP 1 NR FESTIVOIDES | | G5 | SU | | | |
| ELLIPSARIA LINEOLATA | BUTTERFLY MUSSEL | G4 | SX | | PX | |
| ELLIPTIO CRASSIDENS | ELEPHANT EAR | G5 | SX | | PX | |
| ELLIPTIO FISHERIANA | NORTHERN LANCE | G4 | SH | | CU | |
| ELLIPTIO PRODUCTA | ATLANTIC SPIKE | G4Q | S2 | | N | |
| ENALLAGMA BOREALE | BOREAL BLUET | G5 | S2 | | | |
| ENALLAGMA LATERALE | LATERAL BLUET | G3 | S1 | | | |
| EPIGLAEA APIATA | POINTED SALLOW | G5 | S3S4 | | | |
| EPIOBLASMA TORULOSA | | | | | | |
| RANGIANA | NORTHERN RIFFLESHELL | G2T2 | S2 | PE | PE | LE |
| EPIOBLASMA TRIQUETRA | SNUFFBOX | G3 | S1 | | PE | |
| EPIRRITA AUTUMNATA | | | | | | |
| HENSHAWI | NOVEMBER MOTH | G5T5 | SU | | | |
| ERASTRIA COLORARIA | BROAD-LINED ERASTRIA MOTH | G4 | S1 | | | |
| ERYNNIS LUCILIUS | COLUMBINE DUSKYWING | G4 | S1S2 | | | |
| ERYNNIS MARTIALIS | MOTTLED DUSKYWING | G3G4 | S1S2 | | | |
| ERYNNIS PERSIUS PERSIUS | PERSIUS DUSKYWING | G5T2T3 | S1S2 | | | |
| EUCHLOE OLYMPIA | OLYMPIA MARBLE | G4G5 | S1 | | | |
| EUPHYES CONSPICUUS | BLACK DASH | G4 | S3 | | | |
| EUPHYES DION | SEDGE SKIPPER | G4 | S1 | | | |
| EURYLOPHELLA BICOLOROIDES | | G3 | S? | | | |
| EURYLOPHELLA POCONOENSIS | | G1 | S? | | | |
| EUXOA VIOLARIS | VIOLET DART MOTH | G4 | SH | | | |
| FAGITANA LITTERA | A NOCTUID MOTH | G4 | SH | | | |
| FIXSENIA FAVONIUS ONTARIO | NORTHERN HAIRSTREAK | G4T4 | S1S3 | | | |
| FUSCONAIA FLAVA | WABASH PIGTOE | G5 | S2 | | PE | |
| FUSCONAIA SUBROTUNDA | LONG-SOLID | G3 | S1 | | PE | |
| GLAUCOPSYCHE LYGDAMUS | | | | | | |
| LYGDAMUS | SILVERY BLUE | G5T4 | S2 | | | |
| GLENA COGNATARIA | BLUEBERRY GRAY | G4 | S1 | | | |
| GOMPHAESCHNA ANTILOPE | SOUTHERN BOG DARNER | G4 | SH | | | |
| GOMPHUS ABBREVIATUS | ABBREVIATED CLUBTAIL | | | | | |
| GOMPHUS ADELPHUS | DRAGONFLY | G3G4 | S2 | | | |
| GOMPHUS DESCRIPTUS | MOUSTACHED CLUBTAIL | G4 | S? | | | |
| GOMPHUS FRATERNUS | HARPOON CLUBTAIL | G4 | S1S2 | | | |
| GOMPHUS LINEATIFRONS | BROTHERLY CLUBTAIL | G5 | S2S3 | | | |
| GOMPHUS QUADRICOLOR | LINED CLUBTAIL | G4 | SX | | | |
| GOMPHUS ROGERSI | RAPIDS CLUBTAIL | G3G4 | S1S2 | | | |
| GOMPHUS VENTRICOSUS | ROGER'S CLUBTAIL | G4 | S1 | | | |
| GOMPHUS VIRIDIFRONS | WIDE-TAILED CLUBTAIL | G3 | SX | | | |
| GRAMMIA PHYLLIRA | GREEN-FACED CLUBTAIL | G3 | S1 | | | |
| HELOCORDULIA UHLERI | PHYLLIRA TIGER MOTH | G4 | SH | | | |
| HEMARIS GRACILIS | UHLER'S SUNFLY | G5 | S3 | | | |
| HEMILEUCA MAIA | GRACEFUL CLEARWING | G3G4 | SH | | | |
| HEMILEUCA SP 3 | BARRENS BUCKMOTH | G5 | S1S2 | | | |
| HEMIPACHNOBIA | MIDWESTERN FEN BUCKMOTH | G3G4Q | S1 | | | |
| MONOCHROMATEA | | | | | | |
| HEMISTENA LATA | SUNDEW CUTWORM MOTH | G4 | S2S3 | | | |
| HEPTAGENIA CULACANTHA | CRACKING PEARLYMUSSEL | G1 | SX | | PX | LE |
| HESPERIA ATTALUS | | G3 | S? | | | |
| SLOSSONAE | DOTTED SKIPPER | G3G4T3 | SX | | | |
| HESPERIA LEONARDUS | | | | | | |
| HESPERIA METEA | LEONARD'S SKIPPER | G4 | S3S4 | | | (PS) |
| HETAERINA TITIA | COBWEB SKIPPER | G4G5 | S2S3 | | | |
| HOLOMELINA LAETA | TITIAN RUBY-SPOT | G5 | S2 | | | |
| HOLOMELINA NIGRICANS | JOYFUL HOLOMELINA MOTH | G5 | SU | | | |
| HYDRAECIA IMMANIS | | GHQ | S? | | | |
| HYDRAECIA STRAMENTOSA | A NOCTUID MOTH | G4 | SU | | | |
| | A MOTH | G4 | SU | | | |

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|----------------------------------|--------------------------------------|------|------|---|------|----|
| IDAEA EREMIATA | | G4 | S1 | | | |
| IDAEA VIOLACEARIA | A WAVE MOTH | G4 | S1 | | | |
| INCISALIA HENRICI | HENRY'S ELFIN | G5 | S2S3 | | | |
| INCISALIA IRUS | FROSTED ELFIN | G3 | S2 | | | |
| INCISALIA POLIA | HOARY ELFIN | G5 | S1 | | | |
| ISONYCHIA HOFFMANI | | G1 | S? | | | |
| ITAME SP 1 | BARRENS ITAME (cf I. INEXTRICATA) | G3 | S1 | | | |
| LAGOA CRISPATA | BLACK-WAVED FLANNEL MOTH | G5 | S1 | | | |
| LAMPSILIS ABRUPTA | PINK MUCKET | G2 | SX | | PX | LE |
| LAMPSILIS CARIOSA | YELLOW LAMPMUSSEL | G3G4 | S3S4 | | CU | |
| LAMPSILIS RADIATA | EASTERN LAMPMUSSEL | G5 | S2 | | CU | |
| LANTHUS PARVULUS | ZORRO CLUBTAIL | G4 | S3S4 | | | |
| LASIVUS MINUTIS | AN ANT | G7 | S? | N | | |
| LASMIGONA COMPLANATA | WHITE HEELSPLITTER | G5 | S1 | | PE | |
| LASMIGONA COMPRESSA | CREEK HEELSPLITTER | G5 | S2S3 | | PE | |
| LASMIGONA SUBVIRIDIS | GREEN FLOATER | G3 | S2 | | CU | |
| LEMMERIA DIGITALIS | A NOCTUID MOTH | G4G5 | SH | | | |
| LEPTODEA FRAGILIS | FRAGILE PAPERSHELL | G5 | S2 | | PT | |
| LEPTODEA OCHRACEA | TIDEWATER MUCKET | G4 | SX | | PX | |
| LEUCORRHINIA PROXIMA | CANADIAN WHITE-FACED SKIMMER | G5 | S2 | | | |
| LIGUMIA NASUTA | EASTERN POND MUSSEL | G4G5 | S1 | | | |
| LITHOMOIA SOLIDAGINIS GERMANA | A MOTH | G5T5 | S3S4 | | | |
| LITHOPHANE FRANCLEMONTI | | GU | SH | | | |
| LITHOPHANE THAXTERI | THAXTER'S PINION MOTH | G4 | SH | | | |
| LORDITHON NIGER | BLACK LORDITHON ROVE BEETLE | G1 | SX | | | |
| LYCAEIDES MELISSA | MELISSA BLUE | G5 | SX | | | |
| LYCAEIDES MELISSA SAMUELIS | KARNER BLUE BUTTERFLY | G5T2 | SX | | (PS) | LE |
| LYCAENA EPIXANTHE | BOG COPPER | G4G5 | S2 | | | |
| LYCAENA HYLUS | BRONZE COPPER | G5 | S2 | | | |
| LYCIA RACHELAE | TWILIGHT MOTH | G4 | S1 | | | |
| MACROMIA ALLEGHANIENSIS | ALLEGHENY RIVER SKIMMER | G4 | SH | | | |
| MARGARITIFERA | EASTERN PEARLSHELL | G4 | S1 | | PE | |
| MARGARITIFERA | | | | | | |
| MEGACEPHALA VIRGINICA | VIRGINIA BIG-HEADED TIGER BEETLE | G5 | SH | | | |
| MEROLONCHE DOLLI | DOLL'S MEROLONCHE | G3G4 | S1 | | | |
| MEROPE TUBER | EARWIG SCORPIONFLY | G3G5 | SU | | | |
| METARRANTHIS APICIARIA | BARRENS METARRANTHIS MOTH | GU | SH | | | |
| METAXAGLAEA SEMITARIA | FOOTPATH SALLOW MOTH | G5 | S2 | | | |
| MITOURA GRYNIA | OLIVE HAIRSTREAK | G5 | S3 | | | |
| NANNOthemis BELLA | DWARF SKIMMER | G4 | SH | | | |
| NASIAESCHNA PENTACANTHA | BLUE-NOSED DARNER | G5 | S2 | | | |
| NICROPHORUS AMERICANUS | AMERICAN BURYING BEETLE | G2G3 | SH | | | LE |
| NICROPHORUS MARGINATUS | A BURYING BEETLE | G? | SX | | | |
| OBLIQUARIA REFLEXA | THREEHORN WARTYBACK | G5 | SX | | PX | |
| OBOVARIA OLIVARIA | HICKORYNUT | G4 | SX | | PX | |
| OBOVARIA RETUSA | RING PINK | G1 | SX | | PX | LE |
| OBOVARIA SUBROTUNDA | ROUND HICKORYNUT | G4 | S1 | | PE | |
| OLIGIA HAUSTA | NORTHERN BROCADE MOTH | G4 | S1 | | | |
| OPHIOGOMPHUS ANOMALLUS | IRREGULAR SNAKETAIL | G3 | S1 | | | |
| OPHIOGOMPHUS EDMUNDO | EDMUND'S SNAKETAIL | G1G2 | SX | | | |
| OPHIOGOMPHUS HOWEI | MIDGET SNAKETAIL DRAGONFLY | G3 | S1 | | | |
| OPHIOGOMPHUS MAINENSIS | TWIN-HORNED SNAKETAIL | G4 | S3 | | | |
| ORCONECTES PROPINQUUS | NORTHERN CLEARWATER CRAYFISH | G5 | S3S4 | | | |
| OXYSONA CUBANA | A SAC-SPIDER | G? | S? | N | | |
| PALAEONETES KADIAKENSIS | MISSISSIPPI GRASS SHRIMP | G4 | SU | | | |
| PANOQUINA PANOQUIN | SALT-MARSH SKIPPER | G5 | SH | | | |
| PAPAPEMA AERATA | A BORER MOTH | GH | SH | | | |
| PAPAPEMA LEUCOSTIGMA | COLUMBINE BORER | G4 | SU | | | |
| PAPAPEMA MARGINIDENS | A BORER MOTH | G4 | SU | | | |
| PAPAPEMA SP 1 | FLYPOISON BORER MOTH | G2G3 | S2 | | | |
| PAPAPEMA SP 2 | | G3G4 | S? | | | |
| PAPILIO CRESPHONTES | GIANT SWALLOWTAIL | G5 | S2 | | | |
| PARAHYPENODES QUADRALIS | | G4 | SU | | | |
| PARALEPTOPHLEBIA ASSIMILIS | | G2 | S? | | | |
| PHOBERIA ORTHOSIODES | AN OAK MOTH | G4 | S3 | | | |
| PHYCIODES BATESII | TAWNY CRESCENT | G4 | SH | | | |
| PHYCIODES SELENIS | PASCO CRESCENT | G5 | S3S4 | | | |
| PLATYPERIGEA MERALIS | A NOCTUID MOTH | G4 | S1 | | | |
| PLETHOBASUS COOPERIANUS | ORANGE-FOOT PIMPLEBACK | G1 | SX | | PX | LE |
| PLETHOBASUS CYPHYUS | SHEEPNOSE MUSSEL | G3 | S1 | | PE | LE |
| PLEUROBEMA CLAVA | CLUBSHELL | G2 | S1S2 | | PE | LE |
| PLEUROBEMA CORDATUM | OHIO PIGTOE | G3 | SX | | PX | LE |
| PLEUROBEMA PLENUM | ROUGH PIGTOE | G1 | SX | | PX | LE |
| PLEUROBEMA PYRAMIDATUM | PYRAMID PIGTOE | G2 | SX | | PX | LE |
| PLEUROBEMA SINTOXIA | ROUND PIGTOE | G4 | S2 | | PE | |

| | | | | | |
|----------------------------|----------------------------------|---------|-----------|--|---------|
| POANES MASSASOIT | MULBERRY WING | G4 | S2 | | |
| POANES VIATOR VIATOR | BROAD-WINGED SKIPPER | G5T4 | SU | | |
| POANES VIATOR ZIZANIAE | BROAD-WINGED SKIPPER | G5T5 | S1 | | |
| POLYGONIA FAUNUS | FAUNUS ANGLEWING | G5 | S3S4B,SZN | | |
| POLYGONIA PROGNE | GRAY COMMA | G5 | SU | | |
| PONTIA PROTODICE | CHECKERED WHITE | G4 | SH | | |
| POTAMILUS ALATUS | PINK HEELSPLITTER | G5 | S2 | | PT |
| PROCAMBARUS ACLUTUS | WHITE RIVER CRAWFISH | G5 | SU | | |
| PROGOMPHUS OBSCURUS | OBSCURA CLUBTAIL | G5 | S2 | | |
| PROPERIGEA SP 1 | A NOCTUID MOTH | G2G3Q | S1 | | |
| PSECTRAGLAEA CARNOSA | PINK SALLOW | G3 | S1 | | |
| PYREFERRA CEROMATICA | ANointed SALLOW MOTH | GU | SX | | |
| PYRGUS WYANDOT | SOUTHERN GRIZZLED SKIPPER | G2 | S1 | | |
| QUADRULA CYLINDRICA | RABBITSFOOT | G3 | S1 | | PE |
| QUADRULA METANEVRA | MONKEYFACE | G4 | SX | | PX (PS) |
| QUADRULA PUSTULOSA | PIMPLEBACK | G5 | SX | | PX |
| QUADRULA QUADRULA | MAPLELEAF | G5 | S1S2 | | PT |
| RENIA SP 1 NR DISCOLORALIS | | G4 | S1? | | |
| RHODOECIA AURANTIAGO | AUREOLARIA SEED BORER | G4 | SH | | |
| RICHIA GROTEI | A NOCTUID MOTH | G4 | S1 | | |
| SEMIOTHISA PROMISCUATA | PROMISCUOUS ANGLE | G4 | S1 | | |
| SIDERIDIS MARYX | | G4 | S1S3 | | |
| SIMPSONAIAS AMBIGUA | SALAMANDER MUSSEL | G3 | S17 | | CU |
| SINGA EUGENIE | AN ORB-WEAVER SPIDER | G? | S? | | N |
| SOMATOCHLORA ELONGATA | SKI-TAILED EMERALD | G5 | S2 | | |
| SOMATOCHLORA FORCIPATA | FORCIPATE BOG SKIMMER | G5 | S2 | | |
| SOMATOCHLORA INCURVATA | MICHIGAN BOG SKIMMER | G4 | S1 | | |
| SOMATOCHLORA LINEARIS | LINED BOG SKIMMER | G5 | S1 | | |
| SOMATOCHLORA WALSHII | WALSH'S EMERALD | G5 | S2 | | |
| SOMATOCHLORA WILLIAMSONI | WILLIAMSON'S BOG SKIMMER | G5 | S1 | | |
| SPEYERIA DIANA | DIANA | G3 | SAH | | |
| SPEYERIA IDALIA | REGAL FRITILLARY | G3 | S1 | | |
| SPHALLOPLANA PRICEI | REFTON CAVE PLANARIAN | G1G3 | S1 | | |
| SPHINX FRANCKII | FRANCK'S SPHINX MOTH | G4 | SH | | |
| SPHINX GORDIUS | | G4 | S1S3 | | |
| SPONGILLA LACUSTRIS | A FRESHWATER SPONGE | G? | S1? | | |
| STAMNODES GIBBICOSTATA | SHINY GRAY CARPET MOTH | G4 | SU | | |
| STAPHYLLUS HAYHURSTII | SCALLOPED SOOTYWING | G5 | S1 | | |
| STENACRON GILDERSLEEVEI | | G3 | S? | | |
| STYGOBROMUS | ALLEGHENY CAVE AMPHIPOD | G4 | S2S3 | | |
| ALLEGHENIENSIS | | | | | |
| STYGOBROMUS BIGGERSI | BIGGERS' CAVE AMPHIPOD | G2G4 | S1 | | |
| STYGOBROMUS FRANZI | FRANZ'S CAVE AMPHIPOD | G2G3 | S? | | |
| STYGOBROMUS GRACILIPES | SHENANDOAH VALLEY CAVE AMPHIPOD | G2G4 | S1 | | |
| STYGOBROMUS PIZZINII | PIZZINI'S CAVE AMPHIPOD | G2G4 | S1 | | |
| STYGOBROMUS STELLMACKI | STELLMACK'S CAVE AMPHIPOD | G1G2 | S1 | | |
| STYGOBROMUS TENUIS | POTOMAC GROUNDWATER AMPHIPOD | G4T3T4Q | S1 | | |
| POTOMACUS | | | | | |
| STYLURUS AMNICOLA | RIVER CLUBTAIL DRAGONFLY | G4 | SX | | |
| STYLURUS NOTATUS | MARKED CLUBTAIL | G3 | SX | | |
| STYLURUS PLAGIATUS | OBLIQUE CLUBTAIL | G5 | SX | | |
| STYLURUS SCUDDERI | ZEBRA CLUBTAIL | G4 | S1 | | |
| SUTYNA PRIVATA TELTOWA | | G5T4 | S1 | | |
| SWAMMERDAMIA CASTANEA | YPONOMEUTID MOTH | GHQ | SX | | |
| SYMPETRUM COSTIFERUM | SAFFRON-BORDERED MEADOWFLY | G5 | S1? | | |
| SYNANTHEDON CASTANEA | AMERICAN CHESTNUT CLEARWING MOTH | G3G5 | SH | | |
| TACHOPTERYX THOREYI | THOREY'S GRAYBACK DRAGONFLY | G4 | S3 | | |
| THORYBES CONFUSIS | EASTERN CLOUDYWING | G4 | SH | | |
| TOLYPE NOTIALIS | TOLYPE MOTH | G? | S1 | | |
| TOXOLASMA PARVUM | LILLIPUT | G5 | S1S2 | | PE |
| TRITOGONIA VERRUCOSA | PISTOLGRIP MUSSEL | G4 | S1 | | PE |
| TRUNCILLA DONACIFORMIS | FAWNSFOOT | G5 | S1 | | CU |
| TRUNCILLA TRUNCATA | DEERTOE | G5 | SX | | PX |
| VILLOSA FABALIS | RAYED BEAN MUSSEL | G1G2 | S1S2 | | PE |
| VILLOSA IRIS | RAINBOW MUSSEL | G5 | S1 | | PE |
| XYLOTYPE CAPAX | BROAD SALLOW MOTH | G4 | S3 | | |
| ZALE CUREMA | A ZALE MOTH | G3G4 | S1 | | |
| ZALE METATA | A ZALE MOTH | G5 | S? | | |
| ZALE OBLIQUA | OBLIQUE ZALE MOTH | G5 | S1 | | |
| ZALE SP 1 | PINE BARRENS ZALE | G3Q | S1 | | |
| ZALE SQUAMULARIS | | G4 | S2S3 | | |
| ZALE SUBMEDIANA | A ZALE MOTH | G4 | S2 | | |
| ZANCLOGNATHA MARTHA | PINE BARRENS ZANCLOGNATHA | G4 | S1S2 | | |

Global Rank Definitions

Global ranks (i.e. range-wide conservation status ranks) are assigned at NatureServe's Headquarters or by a designated lead office in the Heritage/Conservation Data Center Network.

Basic Global Rank Codes and Definitions

- GX Presumed Extinct** - Believed to be extinct throughout its range. Not located despite intensive searches of historic sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
- GH Possibly Extinct** - Known from only historical occurrences. Still some hope of rediscovery.
- G1 Critically Imperiled** - Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) or acres (<2,000) or stream miles (<10).
- G2 Imperiled** - Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000) or acres (2,000 to 10,000) or stream miles (10 to 50).
- G3 Vulnerable** - Vulnerable globally either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
- G4 Apparently Secure** - Uncommon but not rare, and usually widespread. Possibly cause for long-term concern. Typically more than 100 occurrences and more than 10,000 individuals.
- G5 Secure** - Common, typically widespread and abundant. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

Variant Global Ranks

- G#G# Range Rank** - A numeric range rank (e.g., G2G3) is used to indicate uncertainty about the exact status of a taxon.
- GU Unrankable** - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
- G? Unranked** - Global rank not yet assessed.
- HYB Hybrid** - Element represents an interspecific hybrid.

Rank Qualifiers

- ? **Inexact Numeric Rank** - Denotes inexact numeric rank.
- Q **Questionable Taxonomy** - Taxonomic status is questionable; numeric rank may change with taxonomy.
- C **Captive or Cultivated Only** - Taxon at present is extant only in captivity or cultivation, or as a reintroduced population not yet established.

Intraspecific Taxon Ranks

- T **Intraspecific Taxon (trinomial)** - The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species= basic rank (e.g., a G1T2 subrank should not occur). A population (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an intraspecific taxon and given a T rank; in such cases a Q is used after the T rank to denote the taxon's questionable taxonomic status.

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State Rank Definitions

State Rank Codes and Definitions

- SX **Extirpated** - Element is believed to be extirpated from the "state" (or province or other subnational unit).
- SH **Historical** - Element occurred historically in the state (with expectation that it may be rediscovered), perhaps having not been verified in the past 20 years, and suspected to be still extant. Naturally, an Element would become SH without such a 20-year delay if the only known occurrences in a state were destroyed or if it had been extensively and unsuccessfully looked for. Upon verification of an extant occurrence, SH-ranked Elements would typically receive an S1 rank. The SH rank should be reserved for Elements for which some effort has been made to relocate occurrences, rather than simply ranking all Elements not known from verified extant occurrences with this rank.

- S1 Critically Imperiled** - Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres.
- S2 Imperiled** - Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals or acres.
- S3 Vulnerable** - Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences.
- S4 Apparently Secure** - Uncommon but not rare, and usually widespread in the state. Usually more than 100 occurrences.
- S5 Secure** - Demonstrably widespread, abundant, and secure in the state, and essentially ineradicable under present conditions.
- S?** **Unranked** - State rank is not yet assessed.
- SU Unrankable** - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible, the most likely rank is assigned and a question mark added (e.g., S2?) to express uncertainty, or a range rank (e.g., S2S3) is used to delineate the limits (range) of uncertainty.
- S#S# Range Rank** - A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the exact status of the Element. Ranges cannot skip more than one rank (e.g., SU should be used rather than S1S4).
- HYB Hybrid** - Element represents an interspecific hybrid.
- SE Exotic** - An exotic established in the state; may be native in nearby regions (e.g., house finch or catalpa in eastern U.S.).
- SE# Exotic Numeric** - An exotic established in the state that has been assigned a numeric rank to indicate its status, as with S1 through S5.
- SA Accidental** - Accidental or casual in the state (i.e., infrequent and outside usual range). Includes species (usually birds or butterflies) recorded once or only a few times. A few of these species may have bred on the one or two occasions they were recorded. Examples include European strays or western birds on the East Coast and vice-versa.
- SZ Zero Occurrences** - Not of practical conservation concern in the state because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations have little or no conservation value for the migrant as they are typically too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. In other words, the migrant regularly passes through the subnation, but enduring, mappable Element Occurrences cannot

be defined. Typically, the SZ rank applies to a non-breeding population in the subnation -- for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population, for example certain Lepidoptera which regularly die out every year with no significant return migration. Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ only applies when the migrants occur in an irregular, transitory, and dispersed manner.

- SP Potential** - Potential that Element occurs in the state but no extant or historic occurrences reported.
- SR Reported** - Element reported in the state but without a basis for either accepting or rejecting the report. Some of these are very recent discoveries for which the program hasn't yet received first-hand information; others are old, obscure reports.
- SRF Reported Falsely** - Element erroneously reported in the state (e.g., misidentified specimen) and the error has persisted in the literature.
- SSYN Synonym** - Element reported as occurring in the state, but state does not recognize the taxon; therefore the Element is not ranked by the state.
- *** S rank has been assigned and is under review. Contact the individual state Natural Heritage program for assigned rank.
- Not Provided** Species is known to occur in this state. Contact the individual state Natural Heritage program for assigned rank.

Breeding Status Qualifiers

- B Breeding** - Basic rank refers to the breeding population of the Element in the state.
- N Non-breeding** - Basic rank refers to the non-breeding population of the Element in the state.
- Note** A breeding status subrank is only used for species that have distinct breeding and/or non-breeding populations in the state. A breeding-status SRANK can be coupled with its complementary non-breeding-status SRANK. The two are separated by a comma, with the higher-priority rank listed first in their pair (e.g., AS2B,S3N@ or ASHN,S4S5B@).

Other Qualifiers

- ?** **Inexact or Uncertain** - Denotes inexact or uncertain numeric rank. For SE denotes uncertainty of exotic status. (The ? qualifies the character immediately preceding it in the SRANK.)
- C** **Captive or Cultivated** - Element is presently extant in the state only in captivity or cultivation, or as a reintroduced population not yet established.

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Pennsylvania Status 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.

Native Plant Status Codes and Definitions

- 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 taxonomic 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 Legislative Authority: Title 34 Chapter 133, Game and Wildlife Code, revised Dec. 1, 1990, Pennsylvania Game Commission.

Wild Birds and Mammals Status Codes and Definitions

- 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".
- N** No current legal status but is under review for future listing.
-

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

Fish, Amphibians, Reptiles, and Aquatic Organisms Status Codes and Definitions

- 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.

Invertebrates Legislative Authority: No state agency has been assigned to develop regulations to protect terrestrial invertebrates although a federal status may exist for some species. Aquatic invertebrates are regulated by the Pennsylvania Fish Commission but have not been listed to date.

Invertebrates Status Codes and Definitions

- N** No current legal status but is under review for future listing.

Pennsylvania Biological Survey (PBS) Suggested Status Definitions

Pennsylvania Biological Survey (PBS) Suggested Status Codes and

Definitions

Note: the same PBS Status codes and definitions are used for all PNDI tracked species.

- 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".
- 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.
- CP Candidate Proposed** - Species comprising taxa for which the Pennsylvania Biological Survey (PBS) currently has substantial information on hand to support the biological appropriateness of proposing to list as Endangered or Threatened.
- CA Candidate at Risk** - Species that although relatively abundant now are particularly vulnerable to certain types of exploitation or environmental modification.

- CR** **Candidate Rare** - Species which exist only in one of a few restricted geographic areas or habitats within Pennsylvania, or they occur in low numbers over a relatively broad area of the Commonwealth.
- CU** **Condition Undetermined** - Species for which there is insufficient data available to provide an adequate basis for their assignment to other classes or categories.
- PX** **Pennsylvania Extirpated** - Species that have disappeared from Pennsylvania since 1600 but still exist elsewhere.
- DL** **Delisted** - Species which were once listed but are now cited for delisting.
- N** No current legal status, but is under study for future listing.

Federal Status Definitions

Native Plant and Animal Species Legislative Authority: United States Endangered Species Act of 1973; Public Law 93-205. U.S. Fish and Wildlife Service.

Federal Status Codes and Definitions

- LE** **Listed Endangered** - A species which is in danger of extinction throughout all or a significant portion of its range.
- LT** **Listed Threatened** - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- LELT** Listed **Endangered** in part of range; listed **Threatened** in the remaining part.
- PE** **Proposed Endangered** - Taxa proposed to be listed as endangered.
- PT** **Proposed Threatened** - Taxa proposed to be listed as threatened.
- PEPT** Proposed **Endangered** in part of range; proposed **Threatened** in the remaining part.
- C** **Candidate** for listing.
- E(S/A)** Treat as **Endangered** because of similarity of appearance.
- T(S/A)** Treat as **Threatened** because of similarity of appearance.

- XE** Essential **Experimental** population.
 - XN** Nonessential **Experimental** population.
 - "xy" (mixed status)** Status varies for different populations or parts of range.
 - "x" NL** Status varies for different populations or parts of range with at least one part not listed.
-