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Purpose of and Need for Action

Chapter 1: Purpose of and Need for Action

1.1 Introduction

This Final White-tailed Deer Management Plan/Environmental Impact Statement (plan/EIS) presents the National Park Service (NPS) preferred alternative to manage white-tailed deer (*Odocoileus virginianus*) and to provide appropriate response[1] to chronic wasting disease (CWD) at Valley Forge National Historical Park (NHP). It also addresses public and agency comments on the Draft plan/EIS. No sooner than 30 days following publication of the Environmental Protection Agency's (EPA) Notice of Availability (NOA) of this Final plan/EIS, the alternative or actions constituting the approved plan will be documented in a record of decision (ROD) that will be signed by the Regional Director of the Northeast Region.

The purpose of the plan/EIS at Valley Forge NHP is to develop a deer management strategy that supports protection, preservation, and restoration of native vegetation and other natural and cultural resources throughout and beyond the life of this plan/EIS. The purpose of the plan/EIS also is to provide appropriate response to CWD at Valley Forge NHP.

The plan/EIS complies with the National Environmental Policy Act of 1969 (NEPA) and its implementing regulations (40 CFR 1500-1508). The plan/EIS also complies with section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. It presents deer management methods and strategies for Valley Forge NHP, as well as the analysis of existing resource conditions and impacts that may occur to these resources as a result of the proposed management options. The plan has been carried out in cooperation with local, state, and regional entities, as well as other federal agencies. Two science teams (see References: Planning Team, Contributors, and Consultants) assisted with the planning process by: evaluating scientific literature and research on the topics of deer management and CWD; reviewing and recommending monitoring protocols for park deer populations and other park resources; and identifying appropriate action thresholds at which deer management strategies would be implemented. Monitoring protocols and action thresholds were incorporated into all action alternatives evaluated during plan development (see Appendix A). Established thresholds reflect the identified plan objectives to maintain the deer population as one component of a diverse, healthy ecosystem and to prevent unacceptable impacts to other park resources or values. Deer management strategies are adaptive and dynamic, allowing for the incorporation of new scientific information over time that may modify management methods to best meet objectives in taking action.

1.2 Purpose of and Need for Action

An understanding of the purpose of and need for action was developed from analysis of the results of the Valley Forge NHP general management planning process and of data gathered to date. The statement of purpose and need reflects specific conditions at Valley Forge NHP, and also is congruent, as appropriate, with purpose and need statements drafted for ungulate management plans at other units of the national park system.

[1] Response to CWD includes disease surveillance (detection) actions as well as short-term actions to assess disease prevalence and distribution, minimize the likelihood of spread to surrounding communities and amplification within local deer populations, and if possible, promote elimination of CWD.

1.2.1 Purpose of the Plan/EIS

The purpose of the plan/EIS at Valley Forge NHP is to develop a deer management strategy that supports protection, preservation, and restoration of native vegetation and other natural and cultural resources throughout and beyond the life of this plan/EIS. The purpose of the plan/EIS also is to provide appropriate response to chronic wasting disease at Valley Forge NHP.

Forest regeneration has been selected as the primary measure of plan success (PGC 2006b). Although other factors may affect forest regeneration, such as forest canopy, nonnative invasive species, pests/disease, and fire, this plan focuses on the role and impact of white-tailed deer in the ecological environment, which has been documented through research and long-term monitoring at Valley Forge NHP.

1.2.2 Need for Action

Action is needed at this time to address declining forest regeneration and to ensure the protection and restoration of native vegetation, wildlife, and the cultural landscape. The following statements further define the need for action:

- An increasing number of deer in the park over the past two decades has resulted in unacceptable changes in the species composition, structure, abundance, and distribution of native plant communities and associated wildlife.
- Browsing of tree seedlings and shrubs by deer in the park has prevented successful forest regeneration.
- Changes in the proximity of chronic wasting disease to the park boundary and other risk factors have resulted in an elevated risk of chronic wasting disease occurrence within the park.

Significant changes have occurred across Pennsylvania's landscape in recent decades, including the landscape in and around Valley Forge NHP. Among the most dramatic of these changes is the resurgence of white-tailed deer (*Odocoileus virginianus*). Extremely rare at the turn of the 20th century, deer populations in Pennsylvania have not only rebounded, but are now higher than at any other point in time. The white-tailed deer is an adaptable animal that has favorably exploited changes in habitat and hunting pressure brought about by changes in land use patterns and decrease in areas available to hunters associated with suburban development.

1.2.3 Objectives in Taking Action

Objectives are "what must be achieved to a large degree for the action to be considered a success" (NPS 2001). Objectives for managing deer populations must be grounded in the park's enabling legislation, purpose, significance, and mission goals, and must be compatible with the direction and guidance provided by the park's general management plan (GMP) (NPS 2007i). The action alternatives selected for detailed analysis must resolve the purpose of and need for action and meet the plan objectives. The following objectives related to deer management at Valley Forge NHP were developed for this plan.

Vegetation

- Protect and promote restoration of the natural abundance, distribution, structure, and composition of native plant communities by reducing deer browsing.
- Reduce deer browsing pressure enough to promote tree and shrub regeneration that results in a diverse forest structure dominated by native species.
- Promote a mix of native herbaceous plant species and reduce the competitive advantage of invasive, nonnative plant species.

Wildlife and Wildlife Habitat

- Maintain a white-tailed deer population within the park that allows for protection and restoration of native plant communities.
- Protect and preserve other native wildlife species by promoting the restoration of native plant communities.
- Reduce the probability of occurrence, promote early detection, and reduce the probability of spread of chronic wasting disease.

Threatened, Endangered, and Special Status Species

- Protect and promote restoration of special status plant and animal species and their habitat.

Cultural Resources

- Protect the integrity of the cultural landscape, including the patterns of open versus wooded land, commemorative plantings, and vegetative screenings.
- Protect archeological resources by promoting the growth and maintenance of native vegetative cover and reducing trampling and soil erosion.

1.2.4 Authority to Manage White-tailed Deer

The NPS has broad authority to manage wildlife and other natural resources within the boundaries of units of the national park system. According to 16 USC § 1 the NPS "shall promote and regulate the use of Federal areas known as national parks…by such mean and measures as conform with the fundamental purpose of the parks…to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations."

In defining this discretion, the 10th Circuit Court of Appeals overturned a district court decision in *New Mexico State Game Commission v. Udall* (410 F.2d 1197, 1201), holding in part that the NPS "need not wait until the damage through overbrowsing has taken its toll on park plant life … before taking preventative action" (10th Cir. 1969). This discretion has been reinforced over time. In *United States v. Moore*, (640 F. Supp. 164, 166) the court found that Congress had given the Secretary of the Interior great discretion in regulating and controlling wildlife within the national park system. This discretion is further defined by NPS management policy.

NPS *Management Polices 2006* section 4.4.2. states that "[w]henever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species. The Service may intervene to manage populations or individuals of native species only when such intervention will not cause unacceptable impacts to the populations of the species or to other components and processes of the ecosystems that support them."

In addition, the policy restricts management to times when certain conditions exist. One such condition is when "a population occurs in an unnaturally high or low concentration as a result of human influences (such as loss of seasonal habitat, the extirpation of predators, the creation of highly productive habitat through agriculture or urban landscapes) and it is not possible to mitigate the effects of the human influences." Since the deer population at Valley Forge NHP is increasing at a rate that reflects the absence of effective predation and presence of high quality habitat found in the park and surrounding areas, active management of the species is permitted.

As part of any animal population management action, the NPS is required to follow an established planning process, including provisions for public review and comment. NPS *Management Policies 2006* (Section 4.4.2) also requires that parks "assess the results of managing plant and animal populations by conducting follow-up monitoring or other studies to determine the impacts of the management methods on nontargeted and targeted components of the ecosystem." This strategy is described in this plan (see Appendix A), including specific thresholds for taking action and end points on management actions.

1.3 Description of Valley Forge NHP

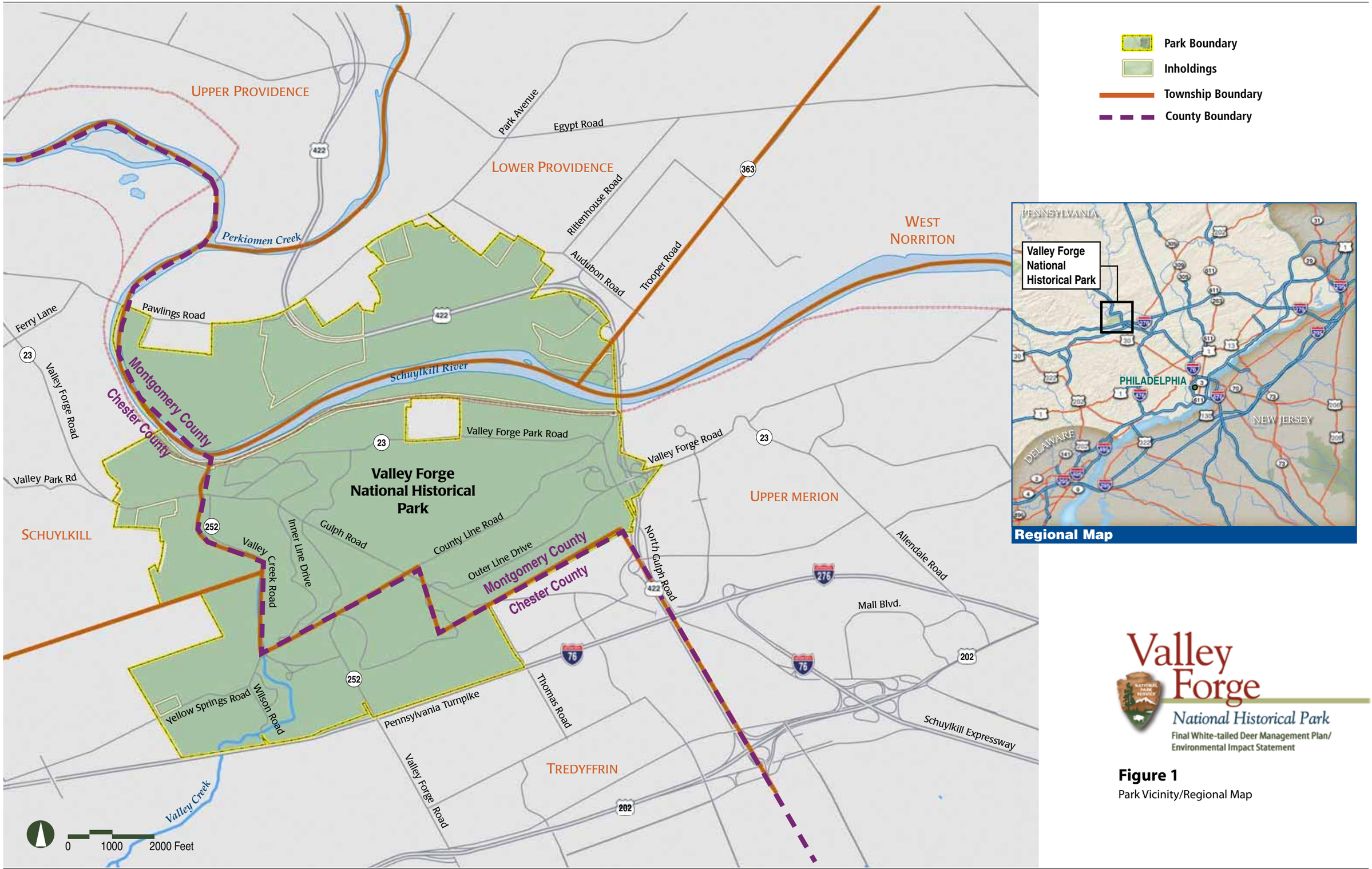
1.3.1 Project Site Location

Valley Forge NHP is located in southeastern Pennsylvania, 18 miles northwest of center city Philadelphia. Situated in rapidly growing suburbs, the park spans portions of two counties: northeastern Chester County and southwestern Montgomery County. The park also is part of five townships: Schuylkill and Tredyffrin Townships to the west and south in Chester County; and Lower Providence, West Norriton, and Upper Merion Townships to the north and east in Montgomery County. Chester and Montgomery Counties are located within the Greater Philadelphia Area, comprised of three additional counties: Bucks, Delaware, and Philadelphia (Figure 1).

1.3.2 Overview of Park Resources

The park comprises the site of the 1777-78 winter encampment of General George Washington's Continental Army. It protects many significant cultural resources, including cultural landscapes, historic buildings and structures, archeological sites, and archives and collections. As suburban sprawl increasingly covers the land around Valley Forge NHP, the park also increases in value as a biorefuge for plants and animals. Supporting over 1,300 species of flora and fauna, habitats within the park include oak/tulip forests, tall grass meadows, wetlands, and forested floodplains.

In addition to its varied cultural and natural resources, the park offers visitors interpretive programming, self-guided walking and driving tours, and newly updated exhibits at the Welcome Center. Overall, many regional visitors appreciate it as a place of recreation and renewal, with approximately 80% of its visitors enjoying the park while walking, biking, boating, fishing, horseback riding, and picnicking (NPS 2007i).



Valley Forge National Historical Park
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Figure 1
Park Vicinity/Regional Map

1.3.3 Boundary and Size

The park boundary was established in 1976 by the enabling legislation that designated the former Valley Forge State Park as a unit of the national park system, transferring ownership from the Commonwealth of Pennsylvania to the NPS. The boundary was expanded by congress in 1980. A number of private parcels were included within the park's boundary at the time of its establishment and expansion, with the expectation that these parcels would eventually be ceded or sold to the park. Today, most of these parcels have been acquired by the federal government. Figure 2 shows the current park boundary, as well as private parcels within it. The park will continue to pursue acquisitions of certain parcels within park boundaries.

The calculation of the size of the park varies according to what parcels or tracts of property are included and excluded, such as private parcels within park boundaries, utility easements, and the rights-of-way of state and local roads. The park comprises 3,452 acres (5.3 square miles), of which approximately 270 acres are nonfederal, including inholdings, roads, and utilities. Because deer are not confined by the park boundary, this study must look beyond the park boundary and consider the home range of the deer that inhabit the park. As noted later in this chapter, the average home range for female deer is 0.46 square miles and the average distance traveled beyond the park boundary is 1,325 feet (Lovallo and Tzilkowski 2003).

1.3.4 Origin and Legislative History

Valley Forge often has been referred to as the "most celebrated encampment." The history of the encampment was first rediscovered and interpreted in the early 19th century, when what might have been an otherwise dreary recounting of suffering and survival was transformed into an inspiring story of triumph through sacrifice. The story has appealed to successive generations of Americans ever since.

As early as 1828, a political rally that attracted some 4,000 people was held at Valley Forge because of the symbolic importance of the place. The encampment's fame began to spread in the 1850s, and the site became a popular place for patriotic rallies and outings. During this time when political troubles split the country along sectional lines, the patriotic understanding of the Revolution as a common cause that united Americans offered a healing narrative. Two historians in this period, Benjamin Lossing and Henry Woodman, crafted a romantic picture of Valley Forge that appealed to the sensibilities of the era. They portrayed Valley Forge as the darkest hour of the Revolution and painted a picture of the encampment as a place where Washington and his soldiers patiently endured horrific conditions and where men literally froze and starved to death. Lossing and Woodman viewed Valley Forge as the ultimate testing ground for patriotism and held up the Continental soldiers as examples to emulate in a time of national crisis.

The celebration of the nation's 100th year of independence in 1876 provided a focal point for strengthening national unity as Americans rallied to remember a common past. Visitors to the Centennial celebrations in Philadelphia came away with a newfound appreciation for Pennsylvania's heritage. This appreciation sparked an interest in preserving Valley Forge as well. In December 1877, a date that marked the centennial of the arrival of Washington's troops at Valley Forge, 13 citizens convened to decide how to appropriately commemorate the encampment. In order to preserve Washington's Headquarters at Valley Forge, the group incorporated itself as the Centennial and Memorial Association (CMA) on July 5, 1878. The mission statement of the CMA expressed its future plans for the site:

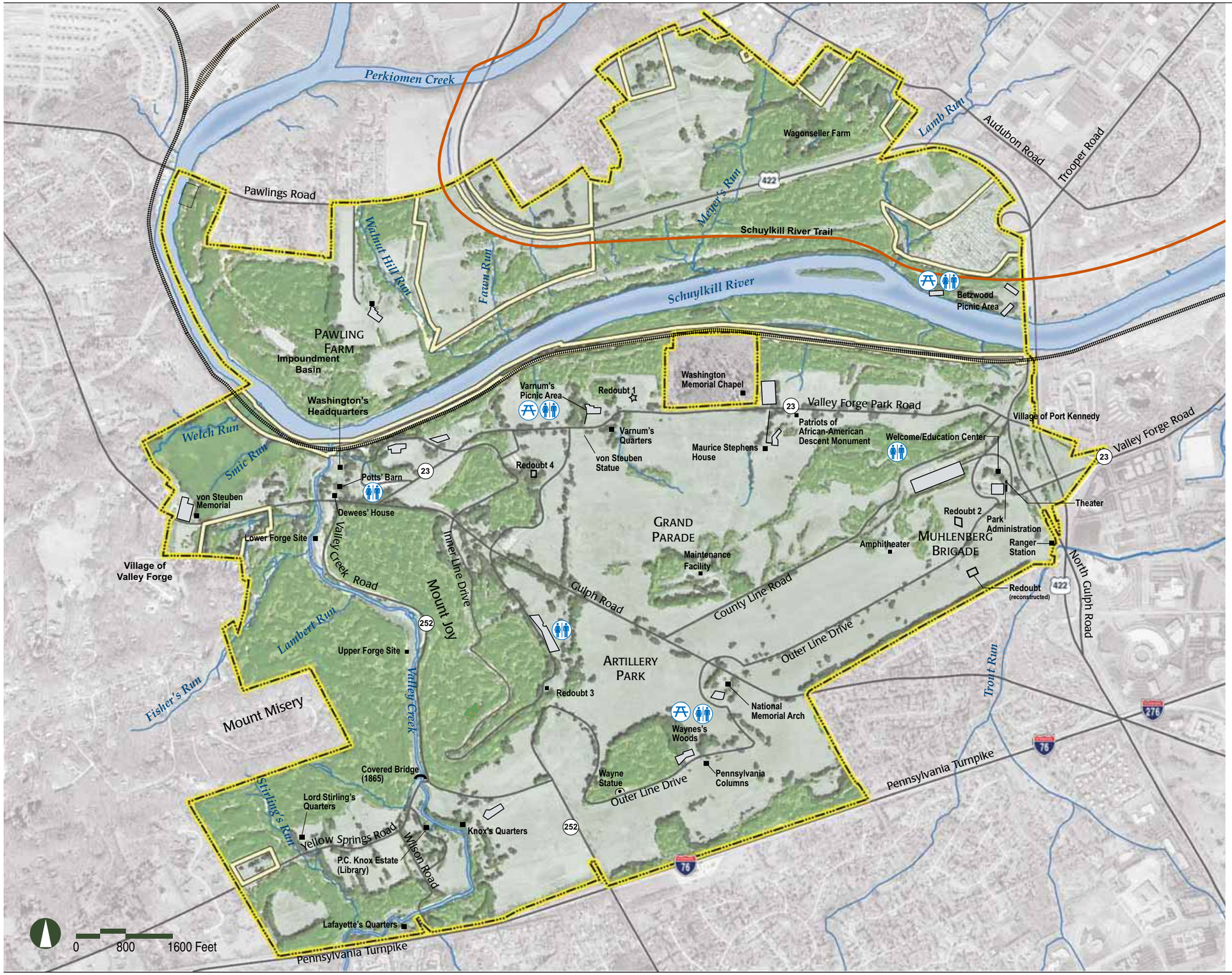
> *The purpose of this Association shall be to purchase, improve and preserve the lands and improvements thereon, occupied by General George Washington, at Valley Forge, and maintain them as a memorial park for all time to come (Stager 1911).*

The CMA acquired the headquarters in 1879 and restored and furnished the building. Washington's Headquarters was the third historic house museum opened in the United States.

In the 1880s and 1890s, rising interest in the Valley Forge landscape's historic and scenic features fostered several attempts to preserve not just Washington's Headquarters but also the encampment grounds. An aggressive campaign led by Francis Mark Brooke resulted in legislation creating Valley Forge State Park in 1893, Pennsylvania's first state park. The legislation enabled the Commonwealth of Pennsylvania to acquire 217 acres of the Continental Army's former encampment ground from private owners and required that the park be maintained in its "original condition" and preserved for "the enjoyment of the people of said State" (Commonwealth of PA 1906). The Valley Forge Park Commission (VFPC), administrators of the site, acquired additional lands and structures through purchase and condemnation, and began to create a landscaped park for both commemorative and recreational use. The VFPC came to believe that the CMA was not properly maintaining Washington's Headquarters, campaigned to secure the house, and obtained title to the building from the association in 1906.

In the early 20th century, a private individual in the Valley Forge community began a personal crusade to draw attention to the role of religion in the American Revolution. His efforts would have a powerful effect on the interpretation of history at Valley Forge. The Reverend Dr. Herbert Burk, an Episcopal minister, believed that George Washington drew on his religious faith to overcome the despair of the Valley Forge winter and resolved to build a chapel there in Washington's honor. In 1903, Burk laid a cornerstone for his memorial chapel on land donated to him. In 1909, he then opened the first museum at Valley Forge and eventually acquired much valuable Washingtonia. Burk and his supporters founded the Valley Forge Historical Society in 1918. Burk zealously pushed forward his vision for interpretation at Valley Forge through his chapel and museum, tour books, and the erection, in cooperation with the Daughters of the Revolution, of the first reconstructed log hut at Valley Forge. Burk's efforts at historical interpretation outshone the VFPC's accomplishments in this area and spurred them to produce their own museum and tourist information. The Washington Memorial Chapel, with its stained glass windows depicting the progress of the nation and Washington's life story, stands out as a monument to the power of civil religion in America.

At the same time as Reverend Burk developed his chapel and museum, the VFPC carried out a memorialization and park beautification program. The commission built carriage drives along the entrenchment lines, constructed an observation tower on Mount Joy, established picnic areas, and erected monuments to the brigades that had camped at Valley Forge. The commission also obliterated the existing agricultural landscape to conform to ideas of suitable grandeur. Barns and other agricultural buildings, fences, and farm lanes were removed, destroying the authentic setting and historic sense of scale. Ornamental groves of dogwoods and alleés of linden trees were planted, and Mount Joy and other areas of the park were reforested.



Valley Forge National Historical Park

Final White-tailed Deer Management Plan/ Environmental Impact Statement

Figure 2

Park Map

In 1911, federal involvement began at Valley Forge when the U.S. Congress appropriated $100,000 for the erection of a National Memorial Arch to honor the Continental Army. Designed by Philadelphia architect Paul Cret, the arch is reminiscent of the Arch of Titus, in Rome. In the years following the establishment of this federal memorial in the state park, interested supporters urged numerous times that the administration of the park be assumed by the federal government, on the rationale that the site deserved more attention than the commonwealth could give.

In the years between the world wars, park management efforts moved forward in fits and starts as funding varied widely. Visitation to the park steadily increased during this period as visitors came first by train and then by car. The increased popularity of heritage sites was spurred by a federal agenda that fostered historical pilgrimages as a way to reinforce patriotism during the trying time of the Great Depression. During World War II and the Cold War, the Valley Forge story again ministered to the needs of a generation in crisis, and many rallies and ceremonies took place on the grounds. Postwar prosperity greatly increased visitation, and attendance grew from 262,646 in 1945 to 1,036,014 in 1950 (Unrau 1985). This increase in use included a growing number of recreational users coming to the park from the city of Philadelphia and the adjacent suburban region. As suburbanization increased and a fitness boom ensued in the 1970s, Valley Forge became a favorite of recreational users. Several years before the nation's Bicentennial, local citizens became concerned that the commonwealth did not have the funds or manpower to properly protect the historic shrine from the pressures of suburban encroachment and an explosion in recreational use. Citizens rallied to have Valley Forge transferred to the national park system.

The Commonwealth of Pennsylvania passed Act No. 53 on July 30, 1975, which authorized the transfer of Valley Forge State Park (by now a National Historic Landmark) to the federal government. The act contains a provision (Section 5) that stipulates that the park land reverts back to the commonwealth if the "premises are no longer used for recreational and historical purposes." On July 4, 1976, President Gerald Ford signed Public Law 94-337, which established Valley Forge National Historical Park. In 1977, the NPS assumed control with a mandate to "preserve and commemorate . . . the heroic suffering, hardship, and determination and resolve of . . . Washington's Continental Army" (NPS 2007i).

Many park supporters had lobbied for a $22 million land acquisition fund to be included in the legislation to enable the NPS to obtain the 869-acre "Chesterbrook" tract adjoining the park for its encampment-period resources and as a buffer to development. Congress passed a more economical bill that transferred the existing state park of 2,255 acres, with a provision for the addition of 216 acres of other private land. A high-density development soon appeared on the Chesterbrook site. On June 28, 1980, Congress passed Public Law 96-287, Title III of which authorized and partially funded an additional land purchase of 682 acres. Today, the park comprises 3,452 acres.

1.3.5 Park Purpose, Significance, and Mission

The U.S. Congress sets aside as national parks places that represent outstanding aspects of our natural and cultural heritage to ensure they receive the highest standards of protection. A statement of **park purpose** captures the reasons for which a park was set aside as part of the national park system. It provides the fundamental criterion against which the appropriateness of all plan recommendations and future operational decisions and actions are tested:

> *The purpose of Valley Forge National Historical Park is to educate and inform present and future generations about the sacrifices and achievements of General George Washington and the Continental Army at Valley Forge, and the people, events, and legacy of the American Revolution; preserve the cultural and natural resources that embody and commemorate the Valley Forge experience and the American Revolution; and provide opportunities for enhanced understanding.*

The park's **significance statement** is based on the establishing legislation as well as on subsequent scholarship about a place or theme. It identifies the resources and values central to managing the park and expresses the importance of the park to our national heritage. Understanding what is nationally significant about a park helps managers make decisions that preserve the resources and values that were the basis for establishment of the park. Such decisions include setting resource management priorities and identifying interpretive themes and appropriate visitor experiences. A statement of significance focuses efforts and funding on the resources and experiences that matter most:

> *Valley Forge National Historical Park is nationally significant as the location of the 1777-78 winter encampment of the Continental Army under General George Washington. Few places evoke the spirit of patriotism and independence, represent individual and collective sacrifice, or demonstrate the resolve, tenacity and determination of the people of the United States to be free as does Valley Forge. The historic landscapes, structures, objects, and archeological and natural resources at Valley Forge are tangible links to one of the most defining events in our nation's history. Here the Continental Army under Washington's leadership emerged as a cohesive and disciplined fighting force. The Valley Forge experience is fundamental to both American history and American myth, and remains a source of inspiration for Americans and the world.*

A park's **mission** is a vision for the future and articulates, in broad terms, the ideas that the NPS strives to achieve:

> *Valley Forge National Historical Park educates the American people about one of the most defining events in our nation's history and preserves the natural and cultural resources that commemorate the encampment of the Continental Army at Valley Forge in 1777-78.*

1.4 Scientific Background: Deer and Vegetation Management

1.4.1 Deer Management Issues and Research Overview

Valley Forge NHP staff has worked with technical experts and researchers to develop and implement methods and protocols for monitoring white-tailed deer population size and the impacts of browsing on forest plant communities. This research, in cooperation with local, state, federal, and regional entities, has informed the development of this plan/EIS. Two science teams, consisting of scientists and other specialists from a variety of state and federal government organizations, have made recommendations that helped define components of the planning process. The team evaluated scientific literature and research on the topics of deer and vegetation

management and CWD. Information evaluated by the technical experts and background materials provided by the NPS are summarized in the following sections. Additional detail is provided in Chapter 3: Affected Environment.

1.4.2 Regional Landscape-Level Changes

White-tailed deer occur throughout Pennsylvania, as well as the contiguous United States (with the exception of portions of the Southwest). Prior to European settlement, North American white-tailed deer populations are estimated to have been between 23 and 24 million, or about 8-11 deer per square mile (McCabe and McCabe 1984). Deer population numbers declined dramatically in the eastern United States after European settlement. In Pennsylvania, the declining deer population size was attributed to unregulated deer harvests, including subsistence and market hunting, and the extensive logging of forests across the state in the 19th and early 20th centuries (PGC 2003; Latham et al. 2005).

Deer were described as scarce by 1895, when the Pennsylvania Game Commission (PGC) was created to protect and preserve game species. To restore the state's deer population, over 1,200 deer were released between 1906 and 1925, and hunting laws were established and enforced (PGC 2003). Across Pennsylvania the deer population recovered rapidly in response to laws regulating deer harvest and protecting antlerless deer, as well as the abundance of early successional habitat created as a result of past logging activities (PGC 2003). This increase is mirrored by the buck harvest which increased nearly 160-fold between 1915 and 2001 (Porter, Coffey, and Hadidian 1994; Latham et al. 2005). Locally, this recovery was noted by the Valley Forge Park Commission in 1939, which describes, "deer in small numbers are making extended stays in the park." Concern over escalating deer densities and alteration of forest plant communities was noted by PGC biologists as early as the mid-1940s (Latham et al. 2005). Despite these concerns, antlerless deer seasons were not held annually until 1956. Between 1982 and 1999, deer density across Pennsylvania was maintained at 50-100% above the recommended PGC density goal (Latham et al. 2005; PGC 2003).

Recovery of the deer population was noted by the Valley Forge Park Commission in 1939: "deer in small numbers are making extended stays in the park."

In national park units in the eastern U.S., such as Valley Forge NHP, landscapes have traditionally been managed to allow for the preservation and rehabilitation of scenic and historic landscapes. The result is a mixture of forest and field, which constitutes excellent habitat for white-tailed deer. As a result of low mortality rates, due to lack of natural predators and recreational hunting, loss of habitat due to urbanization in areas surrounding the park, and the availability of ideal habitat within the park, the population of deer has greatly increased. Today, the deer density in and around the park exceeds 193 deer per square mile (NPS 2009b), and researchers have established that such high deer densities can have direct and indirect adverse impacts on plant and animal communities (Alverson 1988; Anderson 1994; Augustine and Frelich 1998; deCalesta 1994; McShea 2000; McShea and Rappole 2000). Direct impacts from intense browsing include reductions in plant species richness (number of species), plant density and biomass, height growth, and the development of vertical structure. Loss of plant species and vertical structure leading to the decline of animal species that depend on them represents the primary indirect effect of browsing (Latham et al. 2005).

Herds of 25 or more deer are commonly observed during spring compartment counts. (Photo courtesy of Bill Moses.)

1.4.3 Population and Ecological Characteristics of White-tailed Deer at Valley Forge NHP

Deer population growth, density, home range, mortality, and condition at Valley Forge NHP have been assessed through a variety of research and long-term monitoring projects between 1983 and the present.

Trends in Deer Population Size (1983-2007)

From 1983-85, researchers from The Pennsylvania State University (PSU) provided a baseline estimate of deer population size based on a combination of data from aerial surveys, fecal pellet group counts, spotlight counts, diurnal observations of deer, and browsing-grazing surveys (Cypher, Yahner, and Cypher 1985). Population size ranged from 110 (winter/late spring) to 185 (summer) deer or 21-35 deer per square mile.

Park staff have continued to conduct fall spotlight counts according to the standard protocol and route established by Cypher, Yahner, and Cypher (1985) since 1986. Annual spotlight counts allow for comparison of deer abundance across years to provide an estimate of population growth. Spotlight count data indicate that the deer population at Valley Forge NHP has increased significantly between 1986 and 2008. On average, the deer population has increased about 10% each year, with significant fluctuations appearing after 1996.

In 1997, park staff began conducting spring compartment counts on an annual basis according to the protocol established by Lovallo and Tzilkowski (2003). This protocol allows assessment of change in deer population size over time. Deer population size is estimated based on the total number of deer observed across all count areas divided by a sighting index (0.58) which represents the proportion of the population not observed during counts. While this is a standard method for estimating population size (Conroy and Nichols 1996), it may become less accurate over time as park vegetation changes and deer potentially become more or less visible. This index is still considered to be generally accurate for the purposes of estimating deer population size at the park.

Data from spring compartment counts indicates an increase in estimated deer population size from 772 individuals to 1,277 individuals between 1997 and 2009, reaching a maximum of 1,643 in 2008. This reflects a change in deer density from 146 to 241 deer per square mile. The highest deer densities have been recorded in the central and southwestern portions of the park (Lovallo and Tzilkowski 2003).

Home Range and Movements of White-tailed Deer Relative to the Park Boundary (1997-99)

Home range and movement of deer relative to the park boundary was determined by researchers at PSU (Lovallo and Tzilkowski 2003) between 1997 and 1999. The majority of female deer (79%) spent most of their time within the park and traveled, on average, only 401 feet beyond the park boundary. Average annual home range area for females with greater than 50% of their home range area within the park was 0.46 square miles.

Radio-collars allow for identification and tracking of individual deer. On average, female deer at the park only travel between 400 and 1,400 feet outside the park boundary.

Fewer female deer (21%) spent the majority of their time outside the park boundary and traveled, on average, slightly farther from the park boundary (1,325 feet). Average annual home range of female deer with less than 50% of their home range area outside the park was 0.35 square miles[2] (Lovallo and Tzilkowski 2003). Movement of deer across the park boundary was most frequent along the southeastern and southwestern park boundary, and between NPS land and private property on the northwestern park boundary south of Pawlings Road (see Figure 9 in Chapter 3) (Lovallo and Tzilkowski 2003).

White-tailed Deer Mortality (1981-99)

Researchers from PSU first assessed deer mortality and mortality factors at Valley Forge NHP between 1981 and 1985 (Cypher, Yahner, and Cypher 1985). Park staff evaluated factors contributing to deer mortality based on assessment of reported carcasses between 1984 and 1995. Most recently, information related to annual mortality and survival rates was provided through a mark-recapture study conducted by PSU (Lovallo and Tzilkowski 2003) between 1997 and 1999. Results from all research are similar, indicating the primary cause of deer mortality and mortality rate has remained relatively constant over time.

The primary cause of deer mortality in the park is deer-vehicle collisions. Other contributing factors are deer-train collisions, poaching, legal harvest, and unknown causes. The highest mortality rates occurred in the fall between October and December. Lowest mortality rates are experienced in spring. Consistent with other suburban deer populations, annual mortality rate is relatively low (17-28.9%), and annual survival rate is relatively high (71-83%) (Cypher, Yahner, and Cypher 1985, Lovallo and Tzilkowski 2003).

White-tailed Deer Condition

The condition of the white-tailed deer population was qualitatively evaluated by researchers from PSU in 1983-84 (Cypher, Yahner, and Cypher 1985). Their condition was assessed based on productivity, antler growth, and general overall appearance. Researchers concluded that the herd was in good condition (Cypher,

[2] The patterns of male home ranges differ greatly from females. Based on deer's social and reproductive patterns, the female's home range is the basis for measuring population numbers and growth. For this reason, the home range study focused on female deer (Lovallo and Tzilkowski 2003).

Yahner, and Cypher 1985). A similar conclusion was reached in 1999 by Lovallo and Tzilkowski (2003) who stated that, "captured deer [at Valley Forge NHP] appeared to be typical white-tailed deer in terms of gross appearance, condition, and size, as compared to other deer examined in Pennsylvania."

Park staff have collected morphological measurements from animals killed in deer-vehicle collisions as an indication of potential changes in deer condition. Between 1992 and 1995, no trends in body size were detected in fawn, yearling, or adult deer. Comparison of body size with other Pennsylvania deer populations suggested that fawns and yearling deer at Valley Forge NHP were generally smaller in size. A downward trend in body size also was detected in fawn populations (less than 2 weeks of age) between 1997 and 1999 (Rowe and Heister 1999). However, adult deer were similar in size compared to other Pennsylvania deer populations, indicating habitat was sufficient to promote recovery in adults surviving past 1.5 years of age (Heister 1996).

Overall, existing data indicate that as of 1999, deer at Valley Forge were in average condition compared to other deer populations in Pennsylvania and there was no strong (e.g., statistically significant) evidence indicating that the physical condition of the deer at Valley Forge NHP was declining. However, available data also suggests that the population was likely experiencing some level of nutritional stress at that time. This statement is supported by the generally smaller size of younger deer (fawns and yearlings) compared to other deer populations (Heister 1996) and the slight downward trend in fawn body size reported between 1997 and 1999. Although the impacts of nutritional stress may be first observed in younger animals, adult deer appeared to recover and were similar in size to other Pennsylvania deer populations. Current body size and condition of deer in the park are unknown. Anecdotal evidence from park resource management and law enforcement staff suggests the trend toward smaller body size has continued to the present.

Food Habits and Habitat Use

Analysis of fecal pellets collected by Cypher, Yahner, and Cypher (1985) was used to determine seasonal use of food types and use of food types relative to seasonal use of field habitats at Valley Forge NHP. Results indicated that herbaceous vegetation (forbs, leaves of woody plants, and conifer needles) was the predominant food type in all seasons except fall (Cypher, Yahner, and Cypher 1985, 1988). In fall and spring, acorns and grasses were important food resources. Use of woody browse was similar among seasons; and meadow browse was highest during fall, winter with no snow cover, and spring. Meadow use was lowest during the summer because preferred woodland species were abundant. Deer were most often observed in forested habitat during the day and in field habitats at night for forage and bedding (Cypher, Yahner, and Cypher 1985). Field habitats were considered to have year-round importance to the park deer population (Cypher, Yahner, and Cypher 1985, 1988). Similar results were reported by Lovallo and Tzilkowski (2003).

1.4.4 Effects of White-tailed Deer on Vegetation Structure and Diversity at Valley Forge NHP

The impact of deer on park vegetation was initially investigated by Cypher, Yahner, and Cypher (1985). These initial investigations included browse and browse line surveys, as well as comparison of vegetation between fenced and unfenced plots. Data collected between 1983 and 1984 were used to determine the frequency of occurrence of browsing and grazing on available twigs and stems and changes in the

abundance and species composition of shrubs and ground cover. No evidence was found to suggest deer at Valley Forge NHP were adversely impacting forested plant communities at that time. Researchers generally concluded "an overpopulation of deer does not exist" (Cypher, Yahner, and Cypher 1985).

A clear browse line was evident to park managers by the early 1990s. In 1992, park managers initiated long-term vegetation monitoring on Mount Misery and Mount Joy to evaluate changes in the species composition, abundance, and distribution of forest plant communities over time. Between 1993 and 2003, the number of species present in fenced plots increased 27-32%, and the number of species in unfenced plots decreased 6-15%. This data also indicate that no forest regeneration has occurred in unfenced plots since 1995 (Diefenbach 2007). To supplement this monitoring, the NPS Mid-Atlantic Network Inventory and Monitoring (I&M) Program established an additional 28 long-term forest monitoring plots, as part of its Vital Signs Monitoring Program. Between 2007 and 2009, data were collected within 21 plots and an additional 7 plots are scheduled to be established and sampled in 2010. An overall data summary will be provided in 2011.

After 10 years, 30% of fenced monitoring plots in park forests have an acceptable level of tree regeneration. No tree regeneration has been observed in unfenced plots since 1995.

1.5 Other Management Actions

1.5.1 Valley Forge NHP's Current Deer Management

Valley Forge NHP has no formal deer management plan, but does undertake numerous deer management activities. Actions taken to address impacts of deer browsing include the revision of the park's GMP, deer population and vegetation monitoring described in previous sections, support for research related to deer and vegetation, and involvement in state and local agency and community efforts to understand and address issues associated with deer overabundance in the five-county Philadelphia area. In 2007, the park also began implementation of limited CWD surveillance[3].

[3] Limited CWD surveillance actions include taking diagnostic samples for testing from deer found dead or removed through a park management activity.

In 2000, Congress directed the NPS to develop a plan to address the issue of deer management at Valley Forge NHP (House Report 106-646). Initial steps in this effort included the development of natural resource management goals and objectives for the park in the GMP planning process (NPS 2007i), completion of a Cultural Landscape Report (Susan Maxman Architects and John Milner Associates 2002), completion of wildlife inventories, and mapping and classification of the park's vegetation communities (Podniesinski et al. 2005). The focus of the new GMP on the long-term protection, preservation, and restoration of native vegetation and other natural and cultural resources is considered the key step toward development of a formal deer management program.

In 2006, the House Appropriations Report (HR 109-465) included the following language:

> *"The public has been patient as the NPS has worked through its process in regard to management of the over-abundance of white-tailed deer at the park. Within existing funds, NPS is directed to begin the environmental impact statement for deer management. The Committee expects that the plan will be funded fully so that it can be completed in fiscal year 2008. The Committee further expects that implementation of the selected action will begin immediately upon signing of the Record of Decision."*

The NPS published a Notice of Intent to initiate development of a White-tailed Deer Management Plan/EIS in the Federal Register on September 7, 2006.

During the 1990s, park staff participated in community-based efforts to address concerns related to property damage, deer-vehicle collisions, and Lyme disease. For example, in 1993-94, park staff participated on State Representative Carole Rubley's Deer Task Force to share information and approaches to these issues with other state and local government representatives. Park staff also developed a variety of educational materials to assist the public in dealing with issues related to deer.

1.5.2 Deer Management within the NPS

A number of NPS units are in the process of developing management plans for both native and nonnative ungulates[4]. These ungulates include white-tailed deer, elk, nonnative deer, sheep, and goats, among others. The purpose for many of these plans relates to the impacts ungulates have on native plant species.

Deer management planning efforts have been completed for Gettysburg National Military Park and Eisenhower National Historic Site in Pennsylvania. Approved management strategies are now being implemented at Gettysburg. Deer management planning and environmental review efforts are also being undertaken at Catoctin Mountain Park in Maryland (NPS 2008a), Cuyahoga Valley National Park (NPS 2008c) in Ohio, Indiana Dunes National Lakeshore in Indiana (NPS 2008e), and Rock Creek Park in the District of Columbia (NPS 2008f).

[4] A hoofed, typically herbivorous, animal; includes horses, cows, deer, elk, and bison.

1.5.3 Deer Management by Other Federal and State Agencies, and Local Communities

United States Department of Agriculture

The Wildlife Services program of the Animal and Plant Health Inspection Service (APHIS), within the U.S. Department of Agriculture (USDA), has been involved in the evaluation and/or implementation of a number of deer management plans on federal properties in the eastern United States. Studies conducted in New Jersey and Virginia concluded that direct reduction of the deer population was the preferred management alternative (USDA 2000a, 2000b). In Pennsylvania, APHIS is currently involved in implementation of several deer reduction programs on nonfederal properties, including areas within the Fairmount Park System of Philadelphia. Few of these programs have established clear deer density goals or specific, measurable management objectives. However, USDA APHIS is generally a contractor responsible for conducting deer removal actions and not responsible for development of broader scale program goals and objectives. Success is generally evaluated based on number of deer removed.

Pennsylvania Game Commission

Pennsylvania has an unusual three-way resource management structure: the PGC is responsible for mammals and birds, the Pennsylvania Fish and Boat Commission is responsible for aquatic species, and the Pennsylvania Department of Conservation and Natural Resources (DCNR) is responsible for forests (Latham et al. 2005). The PGC is directed by law to use hunting to effect management of game populations (34 PA Code, Section 103). Between 1990 and 2002, the average annual legal harvest ranged from 390,000 to over 500,000 deer statewide (PGC 2003). Efforts to reduce deer numbers in Pennsylvania began in 1957 with establishment of annual antlerless deer seasons and continue to the present. Table 1 provides an outline of changes in deer management in Pennsylvania between 2002 and 2006.

In 2003, the PGC made a fundamental change in deer management from a single-species approach based on deer density as the primary performance measure to an ecosystem approach based on deer health, habitat health, and deer-human conflicts (PGC 2003). This plan was updated in 2006, to refine plan goals and provide primary performance measures for deer and habitat health (PGC 2006b). Plan goals for Pennsylvania are to: (1) manage for a healthy deer population; (2) manage deer for healthy forest habitat; and (3) reduce deer-human conflicts. Reproductive rate was selected as the primary performance measure of deer health, and forest regeneration was selected as the primary performance measure for habitat health (PGC 2006b).

The Population Management Plan for White-tailed Deer in Pennsylvania selected forest regeneration as the primary performance measure for habitat health.

Goals, objectives, and strategies for development of a program to reduce deer-human conflicts in developed areas were published in 2006 (PGC 2006a). The PGC plan for reducing deer-human conflicts in developed areas recognizes that the application of traditional hunting methods in urban or developed areas may be limited, and that nontraditional methods may need to be considered in addressing over-abundant deer populations. The goals of this plan are to: (1) Reduce deer impacts in developed areas as much as possible to socially acceptable levels using hunting options; (2) Reduce deer-human conflicts in developed areas using nonhunting options; (3) Inform urban leadership, residents, and hunters about deer management options and opportunities in developed areas; and (4) Encourage positive relationships between hunters and communities in developed areas (PGC 2006a). However, the plan also indicates that the PGC cannot solve deer-human conflicts in these areas and calls upon public officials and residents to accept long-term responsibility for resolving conflicts and to effectively apply available deer management tools (PGC 2006a).

Table 1 Changes in Pennsylvania's Deer Management Program by PGC between 2002 and 2006

Year	Regulatory or Other Change
2002	Adopted higher minimum antler-size restrictions
	Increased antlerless deer harvest license allocations to 1 million tags
	Conducted stakeholder session on deer management plan goals and objectives
	Proposed new deer management units
	Proposed Deer Management Assistance Program (DMAP)
2003	Adopted strategy provided in *Population Management Plan for White-tailed Deer in Pennsylvania (2003-2007)* (PGC 2003), which redefined deer management goals based on deer health, habitat health, and deer-human conflicts rather than on deer density
	Implemented a limited DMAP for landowners enrolled in the PGC public access programs
	Changed geographic units for administration and planning to 21 ecologically based wildlife management units (WMUs)
2004	DMAP expanded to include most private lands in Pennsylvania
	Legalized use of crossbows in urban WMUs
2005	Extended antlerless deer season to 30 days or more in urban WMUs
	Reduced the 150-yard safety zone for archers to 50 yards in urban WMUs
	Political Subdivision (municipal) Deer Control Program established to aid communities in removing deer by professional means
2006	Updated *Population Management Plan for White-tailed Deer in Pennsylvania (2003-2007)* (PGC 2006b) with primary performance measures for deer and habitat health
	Published *Deer Management Program: A Plan to Reduce Deer-Human Conflicts in Developed Areas* (PGC 2006a)
	Hunting over bait on private property in five-county Philadelphia area approved

To reduce deer impacts through hunting, the PGC currently has three programs available to urban-suburban communities: the Agricultural Depredation Program, DMAP, and the Political Subdivision Control Program. The Agricultural Depredation Program provides additional permits and allows hunting outside of regular hunting seasons for agricultural landowners experiencing sustained crop damage from white-tailed deer browsing. DMAP provides extra antlerless deer permits to individual landowners to keep deer populations in balance with their land use objectives. Public lands, private lands where no fee is charged for hunting, and private hunting clubs are considered eligible properties for DMAP. The Political Subdivision (Municipal) Control Program provides an opportunity for local governments and other political subdivisions to remove deer by shooting outside the regular hunting season. The first municipal deer control permit in the Valley Forge area was issued to the Fairmount Park Commission (FPC) in 2000, for lethal removal of deer in portions of Fairmount Park by professional sharpshooters.

Nontraditional deer management methods are currently considered on a case-by-case basis, and communities must first develop a deer management plan that the PGC must approve. No deer management plans are currently approved for implementation.

Greater Philadelphia Area Deer Management Programs

In the greater Philadelphia area, community focus on escalating deer populations and the potential need for management is a direct response to deer-human conflicts, including a significant increase in deer-vehicle collisions, the incidence of Lyme

disease, and damage to residential landscapes. Few of these programs have clearly stated desired outcomes for management or specific, measurable management objectives. Success is frequently defined based on fewer deer and cultural carrying capacity issues, such as number of complaints received and number of deer-vehicle collisions. Only a few sites, such as Fairmount Park, have established deer density goals and long-term monitoring programs to evaluate the impacts of deer on native plant communities.

Deer reduction programs have been initiated at a minimum of 43 sites over the last four decades within the five-county Philadelphia area. Twenty-nine (70%) of these programs were started in the 1990s in response to growing public concern about deer-human conflicts (Table 2) (PGC 2008). Deer reduction programs include a variety of management strategies including regulated hunts, managed hunts, professional sharpshooting, and combination of lethal and nonlethal (e.g., fencing) management options. Examples of the range of management strategies being implemented in the region are provided by the Pennsylvania DCNR, Chester County Parks and Recreation Department, Tredyffrin Township, FPC, and Schmidts' Tree Farm.

Table 2 Implementation of Deer Reduction Programs within the Greater Philadelphia Area

Location	1970s	1980s	1990s	2000s	Total
State Parks	3	4			7
County Parks			2	4	6
Township Parks			6		6
City Parks			1		1
Schools			1		1
Arboretums			2	2	4
Conservancies/Preserves		1	17		18
Total	3	5	29	6	43

Evansburg, French Creek, Marsh Creek, and Nockamixon State Parks: Regulated Hunting

The Pennsylvania DCNR has permitted traditional or regulated hunting in the state park system since the 1940s, primarily as a recreational activity. Within the Greater Philadelphia Area the majority of state parks are open to traditional hunting in designated areas. Hunting with both firearms and archery is allowed and follows state Game Law and regulations established by DCNR. Maps of hunting zones are available at state park offices, and each park provides signage in the field indicating areas open to hunting and safety zones around residential inholdings. Parks do not close areas open to hunting or track the number of deer removed from park areas although these statistics may be available from the PGC.

Chester County Parks and Recreation Department: Managed Hunts

Approximately one-half of Valley Forge NHP is located within Chester County. The majority of Chester County parks have been open to traditional hunting for several decades, with management of hunting programs provided by individual park units according to PGC hunting regulations. In 2002, the hunting programs in individual park units were consolidated by the Chester County Parks and Recreation

Department (CCPRD) into one centralized system implementing a variety of regulated hunting options. This system uses Pennsylvania Game Law and CCPRD restrictions for personal and public safety. The CCPRD places park and program-specific restrictions on number of permits, hunter eligibility and proficiency, hunting zones, dates and times of hunting activities, parking, firearms, harvest of antlered versus antlerless deer, and use of selected hunting strategies (e.g., baiting). All hunters must present valid Pennsylvania hunting license information and a valid antlerless deer hunting license specific to the WMU being hunted (CCPRD 2007). Hunting opportunities are provided to members of the public by the county, according to a permit system.

Between 2002 and 2007, a total of 441 deer were harvested in Chester County parks. Significantly more deer were harvested with firearms (300) than through use of archery (141). The average number of hunter hours in the field to harvest one deer, known as hunter efficiency, was also lower for those using firearms (23 hours) compared to archery (97 hours) (Prusack, pers. comm. 2007).

Tredyffrin Township: A Variation on Traditional Hunting

Southwestern portions of Valley Forge NHP lie within Tredyffrin Township. Responding to concerns about the deer population, in 1998, the Tredyffrin Township Board of Supervisors approved the use of archery within five township parks. Concern regarding liability and safety led the township to restrict archery hunting to a single hunting group – the Suburban Deer Management Association. Archery hunting is conducted according to Pennsylvania Game Law and in accordance with license requirements, bag limits, seasons, and other regulations as established by the PGC for this Wildlife Management Unit. Approximately 50-60 deer have been removed annually between 1999 and 2006, from township parks.

Additionally, the township initiated a deer harvesting referral program for private property. Through this program the township provides contact information for hunting groups that carry liability insurance and are proficiency tested to property owners interested in reducing the number of deer on their land. The township does not recommend or sponsor any one group for this purpose.

Use of private hunting groups to remove deer on private property has increased in popularity over the last decade. For example, in 1994 the Suburban Deer Management Association had four members hunting 25 properties in Willistown and Tredyffrin Townships. In 2007, this group had 30 members implementing deer control measures on over 100 private properties, six public parks, and common areas for two homeowner's associations in Willistown and Tredyffrin Township (Chester County Deer Forum 2007).

Fairmount Park Commission: Professional Sharpshooting

The FPC is responsible for management of the Fairmount Park System (9,200 acres), composed of 63 individual parks within Philadelphia. Their mission is to "preserve, protect, and maintain open space, street trees, natural and cultural resources of all Philadelphia parks for the recreation and enjoyment of citizens and visitors" (FPC 2007). In 1998, after several years of studying park vegetation and evaluating various deer management strategies, the Friends of the Wissahickon concluded that browsing by deer had resulted in significant adverse impacts to plant communities within the Wissahickon Valley Park and recommended reducing the number of deer through use of professional sharpshooters. The recommended deer density was 10-15 deer per square mile. The FPC accepted this recommendation

contingent on determination that use of sharpshooters within a city park could be conducted safely and effectively. In 1999, the FPC was issued a municipal deer control permit from the PGC and conducted a pilot program using a private contractor/sharpshooter to remove deer in the Wissahickon Valley Park on two nights by shooting over bait. A total of 43 deer were removed and use of sharpshooting was determined to be safe. In 2000, no deer were removed due to repeated tampering with bait stations (Bessler, pers. comm. 2007).

Since 2001, sharpshooting activities have been conducted by the USDA, Wildlife Services Branch in the Wissahickon Valley Park and Pennypack Park. The program expanded to include West Fairmount Park in 2007. Sharpshooting is conducted from park roads and trails primarily within interior park areas, only during winter months (January-March) and between the hours of 8 pm and 6 am. Sharpshooting teams (one to two teams used) consist of one USDA sharpshooter and two FPC staff who drive and spotlight deer. The FPC uses a temporary curfew to close the entire park area when removal activities are scheduled. For the first several years, law enforcement personnel also were needed to enforce the curfew. Between 2001 and 2007, approximately 1,600 deer have been removed from city parks. Approximately 1,000 deer were removed in the first two years of the program. Since 2003, 100-200 deer have been removed annually. Deer are removed to local butchers, and ground meat is provided to Philabundance, a city-wide program that provides food to food banks (Bessler, pers. comm. 2007).

Consultants have been used by the Friends of the Wissahickon and FPC to evaluate plant community condition pre- and post-program implementation and to conduct aerial counts of the deer population (2000 and 2004). No results related to plant community condition are publicly available yet. Funding for USDA staff, butchering, and consultants is provided through a joint funding campaign called "Save the Forests," which is being conducted by the Friends of the Wissahickon and Friends of Pennypack Park (Bessler, pers. comm. 2007). Sharpshooting within parks has been combined with efforts to encourage archery hunting on adjacent private lands.

Schmidts' Tree Farm: Combination of Lethal and Nonlethal Management Options

Schmidts' Tree Farm, located in northern Chester County, has experienced significant damage to Christmas trees and nursery stock due to deer browsing. The property owner initiated a program to directly control deer through hunting, participating in both the state Agricultural Depredation and DMAP programs. In addition, selected higher value nursery stock has been enclosed within an electric fence (Chester County Deer Forum 2007). A similar approach is common for other agricultural landowners as well as local arboreta and nurseries in the greater Philadelphia area.

1.5.4 Other Vegetation Management Issues

Invasive Nonnative Plant Species

Invasive nonnative plants pose a significant threat to the integrity of natural ecosystems across the United States. Spread of these species may impact native plant and animal communities by reducing the amount of light, water, nutrients, and available space. These changes in the native plant community would decrease habitat quality for native wildlife, alter hydrological patterns, soil chemistry, moisture-holding capacity, and erodibility, and may cause changes in the fire regime

(Randall 1996). The nonnative problem is particularly acute in urban parklands where extensive forest fragmentation and creation of "edge" environments, frequent human disturbance, and high deer densities enhance opportunities for invasive, nonnative plants to become established (NPS 2004a).

As native species are removed from the forest understory, aggressive nonnative species, such as Japanese stiltgrass (*Microstegium vimineum*), have taken over the forest floor. This species represents very poor habitat for deer and other wildlife.

At Valley Forge NHP approximately one-third of plants are considered nonnative and 32 species are considered high priority invasive species. These plants invade a broad range of habitats, from forests and meadows to wetlands and roadsides. Removal of native species through selective deer browsing has provided nonnative species a competitive advantage resulting in significant spread of certain species of the past two decades. Large areas of the forest understory at the park are currently dominated by nonnative invasive plant species that outcompete and replace native plant species and disrupt wildlife habitat. Problem species in forested areas of the park include bush honeysuckle (*Lonicera mackii*), garlic mustard (*Alliaria petiolata*), Japanese barberry (*Berberis thunbergii*), Japanese honeysuckle (*Lonicera japonica*), Japanese stilt grass (*Microstegium vimineum*), mile-a-minute weed (*Persicaria perfoliata*), multi-flora rose (*Rosa multiflora*), Oriental bittersweet (*Celastrus orbiculatus*), privet (*Ligustrum* spp.), and tree of heaven (*Ailanthus altissima*) (NPS 2007i). The Mid-Atlantic Exotic Plant Management Team (EPMT) completed identification and prioritization of nonnative plants at Valley Forge NHP in 2007. Efforts to manage and control these species are conducted primarily through the Mid-Atlantic EPMT and park volunteers.

Pests and Disease

Outbreaks of insect herbivores or diseases in Pennsylvania's forests have caused catastrophic mortality of important forest species (Latham et al. 2005). For example, in the early 1900s, the American chestnut (*Castanea dentata*), one of Pennsylvania's most abundant forest trees, was attacked by a Eurasian fungus that ultimately killed almost every chestnut tree in the eastern United States. During a recent visit from U.S. Forest Service (USFS) staff, no significant insect damage or disease condition was observed in park forests. Insect and disease problems identified that may impact

forested communities in the future are: gypsy moth, hemlock woolly adelgid, emerald ash borer, elongate hemlock scale, ash yellows, and ash decline (USFS 2007).

- Gypsy Moth — Gypsy moths (*Lymantria dispar*) target a number of tree species found in the park including chestnut oak (*Quercus prinus*), white oak (*Q. alba*), red oak (*Q. rubra*), black oak (*Q. velutina*), scarlet oak (*Q. coccinea*), American beech (*Fagus grandifolia*), and various hickories (*Carya* spp.). Gypsy moth caterpillars feed on the leaves of these hardwood trees and can cause complete defoliation of a tree, affecting the vigor and general health of forests, and sometimes leading to tree death. Tree death subsequently alters wildlife habitat and affects water quality and quantity. Gypsy moths first caused heavy defoliation of Pennsylvania forests in 1969 (McManus and McIntyre 1981) and subsequent outbreaks have been episodic with lower tree mortality. The USFS conducts aerial surveys to quantify gypsy moth defoliation on an annual basis. No evidence of significant gypsy moth infestation has been documented within the park since 1992.
- Hemlock Woolly Adelgid — The hemlock woolly adelgid (*Adelges tsugae*) feeds by sucking sap from young needles, which causes them to drop prematurely. Extensive tree death is accompanied by detrimental environmental effects, such as the loss of ecological function, the loss of wildlife habitat (in the northeast United States, 96 bird and 47 mammal species are associated with hemlock forests for some critical component of their life cycle [Yamasaki, DeGraaf, and Lanier 1999]), soil erosion, changes in water quality, loss of aesthetics, and diminished recreational opportunities. Impacts on regeneration are attributed primarily to reduced seed production in infested areas. Hemlock woolly adelgid first appeared in southeastern Pennsylvania and has moved slowly toward northwestern portions of the state. Most hemlock populations within the park are currently infested with hemlock woolly adelgid.
- Emerald Ash Borer — The emerald ash borer (*Agrilus planipennis*) is a newly arrived beetle from Asia found attacking and killing ash (genus *Fraxinus*) trees in Canada, Michigan, Ohio, Indiana, and recently in western Pennsylvania (USFS 2007). The USDA, in cooperation with state governments, has placed a quarantine on affected counties to reduce the likelihood of transporting the beetle outside the currently infested areas (USDA 2006b).
- Elongate Hemlock Scale — The elongate hemlock scale (*Fiorinia externa Ferris*) is an armored scale insect pest from Japan that affects mainly eastern hemlocks (*Tsuga canadensis*) and Carolina hemlocks (*Tsuga caroliana*) throughout the eastern U.S. It causes dieback of the limbs and eventual death within ten years. Maintaining hemlocks in healthy conditions discourages the buildup of scale populations. Although control of the pest is not possible in forests, declining hemlocks can be treated or removed to prevent the spread of scale populations (USFS 2007).
- Ash Yellows and Ash Decline — There has been a significant decline of ash trees in both urban and woodland settings due to a variety of factors resulting in poor health and loss of tree vigor (Feeley 2001). Ash yellows is one contributing factor to the decline of ash trees causing severe growth reductions and dieback of white and green ash trees (*Fraxinus* spp.) in the Great Plains and Rocky Mountain regions of the United States (Walla et al. 2000). Ash yellow is widespread in southeastern Canada and was first documented in the eastern Great Plains in 1993 (Walla et al. 2000). Currently, there is no known way to prevent or cure ash yellows (Scarbrough and Juzwik 2004).

Fire

Pre-European settlement period forests in the eastern U.S. were maintained by natural disturbances (e.g., lightning, drought, wind) and anthropogenic factors including Native American fires (Largay and Sneddon 2007). Native Americans used fire to promote nut and fruit production, facilitate hunting and cultivation, and create small settlements. Historically, natural surface fires in southeastern Pennsylvania occurred relatively frequently and created a mosaic of small patches within the forested landscape (Latham et al. 2005; Largay and Sneddon 2007). A policy of suppression has dominated fire management programs across the state since the 1930s-40s, altering the frequency, intensity, and extent of natural fires. Implementation of widespread fire suppression coincides with widespread oak regeneration problems in Pennsylvania (Latham et al. 2005).

Periodic fire is a key factor promoting oak regeneration (Nowacki, Abrams, and Lorimer 1990; Lorimer 1993; Largay and Sneddon 2007). Adaptations of oaks to fire include thick bark, location of resprout buds at the root collar, and initial investment in root growth by seedlings. After fire, oak species resprout at higher rates compared to more fire-sensitive species and benefit from the larger canopy openings created by fire. Generally, a canopy opening greater than 150 square meters (1,615 square feet) is required for oak regeneration compared to the single tree-sized canopy gap required for regeneration by more shade-tolerant species (Largay and Sneddon 2007). Latham et al. (2005) notes that "fire has additional benefits for oaks and other nut trees, including hickories: it discourages insect predators of acorns, nuts, and seedlings; exposes the humus or mineral soil layers to drying, which does more harm to seedlings with less-robust root systems than oaks and hickories; improves germination conditions by consuming leaf litter and other forest floor organic matter; and kills seedlings of most other tree species, whose resprouting buds are at or just above the ground surface, allowing oaks to dominate the advance regeneration pool" (Latham et al. 2005).

Fire suppression in recent decades has favored thin-barked, shade tolerant species such as red maple (*Acer rubrum*) in the understory over oak regeneration in eastern oak-hickory forests (White and White 1996). Largay and Sneddon (2007) predict that in the absence of stand-maintaining disturbances including fire, Dry Oak forests existing in the park today may be replaced by red maple-dominated forests. Remaining oaks in Successional Tuliptree forests within the park may be replaced by other shade-tolerant species, although this forest type is likely to maintain itself as a tuliptree-dominated community (Largay and Sneddon 2007).

Valley Forge NHP's Fire Management Plan (FMP) is essentially a fire suppression plan. The FMP documents the fire management objectives, operational programs, and research required to effectively manage wildland fire within the park. Implementation of the plan focuses on suppression of all wildfires as quickly as possible. A prescribed fire program is not included in the FMP because of the urban-suburban nature of park surroundings. In the absence of prescribed fire as a management tool, park staff may investigate cutting or a form of stand management that mimics the disturbance effects of fire in development of an integrated approach to vegetation management and forest restoration.

Forest Fragmentation

The majority (58%) of Pennsylvania's forests are considered to be fragmented (area less than 300 feet from a road or edge) (PGC 2005). Forest fragmentation occurs when a large area of forested habitat is broken down, or fragmented, into a collection of smaller patches of habitat either through land conversion (e.g., forest to agriculture or development) or the cutting of linear features such as roads and trails into large forested tracts (Cooksey 2000; Fahrig 1998).

Forest fragmentation results in the creation of forest edge habitat - a zone influenced by more open areas adjacent to the forest. Edge habitats experience increased exposure to sun and wind resulting in higher temperatures and less humidity (Wear and Greis 2002). Additionally, these areas have a higher occurrence of nonnative, invasive plant species such as multi-flora rose (*Rosa multiflora*) and tree-of-heaven (*Ailanthus altissima*), are more accessible to predators and parasites that may occur on adjacent lands, and often experience more intense recreational use (Matlack 1993). Vegetation patterns along edges are clearly different from the forest interior and are often characterized by an increased number of tree saplings and greater shrub cover (Matlack 1994). Edge sites also may exhibit changes in plant species composition and abundance compared to vegetation in the forest interior (DCNR 2009).

Research on forest fragmentation and creation of edge habitat has frequently focused on changes in habitat quality for wildlife. This research suggests varied impacts on wildlife depending on the species. Benefits are documented in terms of increased overall species diversity and increased habitat for generalists (e.g., raccoon, opossum, blue jay, and deer) and edge species (e.g., indigo bunting), and adverse impacts are related to decreased habitat quality and decreased survival (e.g., increased predation, reduced nest success) for forest interior species (Wear and Greis 2002; PGC 2005). Wear and Greis (2002) concluded that urban forests of 20 acres or more can support abundant and diverse breeding bird populations. They determined that the primary factor influencing diversity of breeding bird populations in urban woodlots was the amount of woody vegetation, including the presence of a healthy understory and living mature and dead standing trees.

All forests within the park would be considered fragmented, typical of suburban environments. Forested areas in the park vary in size from less than 10 acres to over 200 acres with the majority of forested tracts 20 - 60 acres in size (based on canopy acres). The current mix of field and forest is considered an important element of the cultural landscape as reflected in the plan objectives and described in Section 3.3.1 Cultural Landscapes. Characteristics of fragmented forests are captured in existing descriptions of park vegetation (see Section 3.2.1: Vegetation and Special Status Plant Species – VAFO-type forest community) and long-term monitoring of forest plant communities (see Figure 3 for location of monitoring plots relative to forest edge). No significant change in the amount of forested land in the park is expected to occur in the future. Management of park forests would include maintenance of existing forest stands (ensuring regeneration) and maintaining the current pattern of field and forest as described in the park General Management Plan (NPS 2007i).

1.6 Scoping Process and Public Participation

NEPA regulations require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." To determine the scope of issues to be analyzed in depth in this plan, consultation letters were distributed to relevant agencies (see Appendix B), and meetings were conducted with park staff and other parties associated with preparing this document (see Chapter 5: Consultation and Coordination for additional information). As a result of this scoping effort, several issues were identified as requiring further analysis in this plan. These issues represent existing concerns, as well as concerns that might arise during consideration and analysis of alternatives.

The issues and impact topics developed during scoping are presented in Section 1.7: Impact Topics. These issues formed the basis for the impact topics discussed in Chapters 3 and 4 of this plan/EIS.

1.6.1 Survey of Public Attitudes Towards Deer Management in the Valley Forge Area

In 2007, researchers at Cornell University completed an assessment of the values and attitudes of residents near Valley Forge NHP toward deer management, their understanding of park wildlife management, expectations for public input in management planning, and experiences with the park related to wildlife management (Leong and Decker 2007; Siemer et al. 2007). The survey was initiated prior to the Notice of Intent for the Valley Forge NHP deer management plan and is considered to be an independent effort. However, the findings of this survey have been used to inform the decision-making process and communication strategy for this plan.

Members of the community, including adjacent homeowners, community residents, known stakeholders, and community leaders, were surveyed via in-person interviews and mailed questionnaires. Community members were asked about their experiences related to deer and deer management in and around the park, the role of Valley Forge NHP in deer and other wildlife management, and the influence of public input in wildlife management at the park.

Interviewees identified multiple contributing factors to controversy about deer management at Valley Forge NHP, including concerns about primary impacts from deer (e.g., deer-vehicle collisions, vegetation damage, and wildlife viewing opportunities); concerns about the health of the deer; and concerns about potential management actions. Interviewees believed there were too many deer, and that the NPS should manage deer-related impacts on park resources. Communication needs identified by residents for effective public input were improved understanding about NPS management policies and specific park purpose; improved credibility of park staff; and improved awareness and knowledge of NPS planning processes and facts related to deer issues (Leong and Decker 2007; Siemer et al. 2007).

1.6.2 Internal Scoping and Planning

An internal scoping meeting was held on September 12 and 13, 2006 to initiate the plan/EIS process. Attendees included park officials, representatives from the NPS Northeast Region office, the NPS Environmental Quality Division (EQD), and their consultants. Discussions at the meeting were focused on the management of white-tailed deer as part of a healthy and functioning ecosystem at Valley Forge NHP. The

goal of this meeting was to determine the purpose, need, and objectives for managing deer at the park, as well as to identify issues and concerns associated with the deer populations and their impact on the park ecosystem. Preliminary alternative management strategies were also discussed. Following this meeting, an Internal Scoping Report was drafted to inform the development of the environmental planning process (NPS 2006b).

This group met again on August 15-16, 2007 to select and develop the alternatives that are considered in this plan/EIS. The group reviewed the management strategies that were developed at the internal scoping meeting and compared them according to the strategies' likely ability to meet the objectives of the plan. The alternatives that best met the objectives of the plan were included in this document.

The internal scoping process continued throughout the development of the plan/EIS through regular conference calls and meetings to discuss project issues and come to consensus on important decision points. Further internal planning occurred following the public and agency review of the Draft plan/EIS. The planning team met and conducted several conference calls to review the comments on the document, identify means of improving the plan to respond to these comments, and provide responses to substantive comments (See Appendix F: Comments and Responses on the Draft Plan/ Environmental Impact Statement).

1.6.3 Science Teams

In addition to internal scoping, the NPS assembled two science teams to address deer and vegetation management and CWD. The first team was composed of regional and national experts on forest regeneration, vegetation management, and wildlife management, and individuals with specific experience in deer management (see References: Planning Team, Contributors, and Consultants). The science team participated in regular phone meetings for the first three months of 2007 to discuss and review literature, studies, and professional experience related to measuring impacts of deer browsing, evaluating the success of deer management in forests similar to those at Valley Forge NHP, and the best management strategies available to Valley Forge NHP. Following the science team's final meeting, an internal report was prepared to document the group's discussions and recommendations (NPS 2007g). This report was used to inform the alternatives meeting described above.

The second science team, which focused on CWD, was composed of regional and national wildlife management experts from the NPS and PGC (see References: Planning Team, Contributors, and Consultants). The group participated in several phone meetings in 2008 to discuss and review existing literature, studies, and professional experience related to CWD. The group's discussion focused on the park's proposed response to CWD within the park and its consistency with *Pennsylvania's Chronic Wasting Disease Response Plan* (PCWDTF 2007, 2008). A summary memorandum was prepared to document the results of the group's discussions and recommendations (NPS 2008d). This memorandum was used to inform the CWD Response Plan for Valley Forge NHP (see Appendix C).

1.6.4 Public Scoping and Outreach

The Notice of Intent to prepare the plan/EIS was published in the Federal Register on September 7, 2006. This represented the initiation of the project and the beginning of the public scoping and outreach process. Since this time, the Valley Forge NHP web

site <www.nps.gov/vafo> has provided up-to-date information on the project process, made available public documents, and solicited input on the project.

On November 8 -9, 2006, two public meetings were held. The first meeting was held at the park's Education Center, and the second was held at the Tredyffrin Township building. These meetings were advertised in local papers and on the park's web site, and a brochure with background information and meeting times and locations was mailed to over 3,000 area residents and known stakeholders. Attendees were provided with an information packet on the proposed project, as well as the opportunity to review large scale graphics and posters explaining different details of the project. Park staff provided a short presentation on the background of deer research at the park, issues related to the deer population, and issues related to managing the deer population. Attendees were then divided into small groups where they discussed goals, issues, and concerns with NPS staff and their consultants. Public comments were recorded on flipcharts and later transcribed for further analysis. Additional comments were received through official public comment forms. Following the meeting, the NPS held a 30-day public comment period. Upon the conclusion of the public comment period, all of the comments received at or following the meeting were included in the Public Comment Analysis Report (NPS 2007f). This report was used to inform the alternatives development process and was also posted for public review on the NPS Planning, Environmental, and Public Comment (PEPC) web site, <http://parkplanning.nps.gov/vafo>.

The Draft plan/EIS was released for a 60-day review and comment period from December 19, 2008 to February 17, 2009. Another set of public meetings was held January 14-15, 2009. The meetings were held in the same locations and format as the previous meetings. During the 2009 meetings, the NPS presented the alternatives analyzed in the plan/EIS and identified the preferred alternative. Attendees were then divided into small groups where they discussed the proposed alternatives with NPS staff and their consultants. Public comments were recorded on flipcharts and later transcribed for further analysis. Additional comments were received through official public comment forms. All comments submitted on the Draft plan/EIS were carefully reviewed and entered into PEPC for analysis. The analysis of the comments received and NPS responses is provided as Appendix F of this Final plan/EIS.

Over 150 members of the public participated in meetings to identify deer management alternatives in September 2007.

1.7 Impact Topics

To focus the environmental analysis, the issues identified during scoping were used to derive a number of "impact topics." Impact topics are resources of concern that could be affected, either beneficially or adversely, by implementing any of the proposed alternatives. Impact topics were identified on the basis of federal laws, regulations, Executive Orders, NPS *Management Policies 2006* (NPS 2006c), the Environmental Screening Form (which was prepared during internal scoping), and the results of scoping and coordination with other agencies and the public.

1.7.1 Impact Topics Retained for Further Analysis

Vegetation and Special Status Plant Species

The Valley Forge NHP GMP (NPS 2007i) identifies a number of threats to the park's vegetation. These include recreational activities, future development, and deer browsing. The park has conducted studies, including exclosure plots, to assess the impact of deer on park vegetation. Long-term monitoring of forest plant communities in fenced and unfenced plots suggests significant impacts on species diversity and forest regeneration as a result of heavy deer browsing. Between 1993 and 2003, the number of species present in fenced plots increased 27-32% and the number of species in unfenced plots decreased 6-15%. A similar trend was observed for the diversity and abundance of tree seedlings in fenced and unfenced plots. In 2003, unfenced plots generally contained about one-third the number of tree seedlings present in fenced plots. These data also reveal that in unfenced plots adequate forest regeneration has not occurred since 1995. In 2003, no tree seedlings were found taller than 25 centimeters (9.8 inches) in unfenced monitoring plots (Diefenbach 2007). Continued removal of seedlings in taller height classes by deer browsing will prevent forest regeneration and may significantly impact habitat of associated wildlife species (e.g., lower canopy and ground nesting birds).

Habitat for state-listed threatened or endangered species, rare and unusual species, or species of special concern may be vulnerable to impact from high levels of deer browsing. No plant species currently listed as federally endangered or threatened reside in Valley Forge NHP. However, eight plant species within the park are state-listed special status species. These primarily include species that are listed (or proposed for listing) by the Commonwealth of Pennsylvania as endangered, threatened, rare, or imperiled/vulnerable. At least one state-listed endangered plant species (*Viburnum nudum*) has been fenced to prevent extirpation from the park.

Actions proposed in this document may also impact vegetation and special status plant species. The installation of fencing could result in the displacement of some grasses or small shrubs. It could result in changes to the existing vegetative communities as regeneration was achieved in some areas and not in others. In addition, implementing any type of fencing activity could have temporary impacts to the surrounding vegetation, depending on the specific methods used to install fencing. Therefore, the impact topic of vegetation and special status plant species is considered.

White-tailed Deer Population

In addition to the reduction in the population, the proposed actions may also impact the movement and behavior of the deer population. Fencing would prevent the deer from using select areas in the park, resulting in higher use and competition for

resources within unfenced areas. The use of darts for fertility treatments or any lethal actions could cause deer to avoid certain areas in the park. This could result in higher competition for areas that were not targeted and increased movement across the park boundary. Implementation of reproductive controls also could result in physiological and behavioral changes within the deer population such as repeated estrous cycles and an extended mating season. Therefore, the impact topic of white-tailed deer population is considered.

Other Wildlife, Wildlife Habitat, and Special Status Animal Species

Other wildlife are affected by increasing deer density primarily as a result of the alteration of available suitable habitat or direct competition for limited food resources. Direct competition is generally considered as it relates to impacts on mast-dependent small mammal communities (McShea 2000). Impacts of overbrowsing on forest bird communities are well documented and include changes in species composition, abundance, and distribution. In northwestern Pennsylvania, the threshold at which negative impacts to songbird populations were documented was between 20 and 38 deer per square mile (Latham et al. 2005). Valley Forge NHP has not conducted studies on the impact of deer density on bird or other wildlife communities. However, baseline inventory data related to bird communities in the park have documented the low density of ground-nesting and shrub-nesting bird species within park woodlands. It was suggested that density of these bird species would remain low until the herbaceous and shrub layers in park woodlands are restored (Yahner et al. 2001).

To date, there are no known federally listed animal species confirmed to occur within Valley Forge NHP. There are, however, five state-listed (or proposed for listing) animals that are known to occur within the park. Only one species, the red-bellied turtle (*Pseudemys rubriventris*), is considered a park resident. Observation of the bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), peregrine falcon (*Falco perigrinus*), and yellow-bellied flycatcher (*Empidonax flaviventris*) is described as occasional, rare, or extremely rare within the park. The status and distribution of these species and their essential habitats within Valley Forge NHP is largely unknown.

Actions proposed in this document may also impact wildlife and wildlife habitat. Although any proposed fencing would be designed to allow small animals to pass through the areas, larger animals may have a more difficult time reaching areas within the fence. These fenced areas would represent high quality habitat that was not impacted by deer browsing. This could result in changes to feeding and nesting patterns. Additional impacts could occur if a lethal alternative was implemented. Although other animals would not be targeted by lethal reduction efforts, they could be startled by the sound of the shot or the presence of humans. This could cause temporary changes in daily movement patterns and selection of feeding and nesting sites. Therefore, the impact topic of other wildlife, wildlife habitat, and special status animal species is considered.

Cultural Landscapes

The patterns of wooded versus open habitats, commemorative plantings, and vegetative screening are identified as important elements of the park cultural landscape. In some cases, the activities of high numbers of deer may affect the character of the cultural landscape. As the white-tailed deer population increases, heavy browsing of vegetation may increase, resulting in the potential loss of these important character-defining features of the cultural landscape.

In addition, the implementation of some of the proposed actions could have an impact on cultural landscapes. The use of fencing could represent a visual intrusion on the cultural landscape. Targeting specific landscapes for reproductive treatments or lethal reduction could alter deer movements forcing deer onto other landscapes, accelerating their impact. Therefore, the impact topic of cultural landscapes is considered.

Historic Structures

The park's historic structures include encampment-era earthworks which are protected from erosion only by vegetation. The vegetation that covers the earthworks is increasingly used as a source of food by the growing deer population. Trampling of the earthworks results in vegetation loss, compaction of soil, and an increased rate of erosion. These impacts result in a loss of the historic earthworks. There is the potential for increased impact to these resources as browsing and trampling escalate with the growing deer population.

The implementation of some of the proposed actions could have an impact on historic structures. The use of fencing could protect select areas from browsing and trampling resulting in improved structural stability and slowing rates of soil loss. Increased tree regeneration and establishment of mature trees on earthworks also may lead to long-term maintenance issues. Therefore, the impact topic of historic structures is considered.

Archeological Resources

The archeological heritage of Valley Forge NHP is both vast and of enormous significance. The park's archeological resources document every major period of its occupation and are critical to a full appreciation and interpretation of the site's rich history. The removal of vegetative cover through deer browsing has allowed erosion that has degraded some archeological sites. Trampling of wooded sites by the increasing number of deer also has degraded the sites.

The implementation of some of the proposed actions could have an impact on archeological resources. Implementation of deer management alternatives could require the installation of fencing or other related structures that could require subsurface trenching. The trenching and installation of fence posts has the potential to impact archeological resources. The use of fencing could protect select areas from browsing, protecting the resources. Targeted reproductive treatments or lethal reduction activities could encourage deer to avoid these areas, as well. However, the installation of any fencing would have to be designed to avoid known archeological resources. Unknown resources could be at risk for damage during the installation or removal of any fencing. Therefore, the impact topic of archeological resources is considered.

Visitor Use and Experience

Some visitors to the park view deer sightings as an integral part of their visit. Deer management actions may decrease the potential for visitors to observe deer within the park, reducing satisfaction for some visitors. Conversely, there are visitors who come to the park to enjoy other resources, such as to observe songbirds. Increased deer browse has the potential to impact these other resources and impact the satisfaction of these visitors.

The implementation of some of the proposed actions could have an impact on visitor use and experience. The installation of any fencing could create visual impacts in the park and also prevent visitors from accessing certain areas. Any reproductive treatments or lethal reduction activities may also require visitors to be prohibited from certain areas of the park. As the alternatives were implemented, some visitor experiences may change as the deer population was reduced. Therefore, the impact topic of visitor use and experience is considered.

Socioeconomic Resources and Adjacent Lands

NEPA requires that economic and social impacts be analyzed in an EIS when they are interrelated with natural or physical impacts. Economic impact would potentially result from deer browsing damage to crops and landscaping on private lands adjacent to the park as a result of changes in deer populations at Valley Forge NHP. Based on the research findings on white-tailed deer home range at Valley Forge NHP, it is clear that deer living in the park affect neighboring properties (Lovallo and Tzilkowski 2003). The presence of deer on neighboring properties has been linked to loss and damage of ornamental vegetation.

The implementation of some of the proposed actions could have an impact on socioeconomic resources and adjacent lands. Careful coordination would be required to ensure that deer management activities within the park did not result in an increase in deer browsing outside of the park. Therefore, the impact topic of socioeconomic resources and adjacent lands is considered.

Public Safety

Deer-related diseases may pose health risks to park visitors or area residents. Deer ticks carry Lyme disease, and the Department of Health and Human Services Centers for Disease Control and Prevention has stated that abundant deer and rodent hosts are necessary to maintain the spirochete *Borrelia burgdorferi*. Pennsylvania ranks second in the nation for number of reported cases of Lyme disease, with the majority being reported from southeastern areas of the state near Valley Forge NHP. Between 2003 and 2007, Chester County ranked second in the state for reported cases of Lyme disease (PA Department of Health 2008). Though the deer cannot transmit the disease to humans or ticks, a high deer population provides more hosts and may support a higher than normal tick population compared to lower deer densities (CDC 2009; Stafford 2007).

In addition, traffic volumes within the park have increased in recent years and are expected to continue to increase. High densities of deer and an increase in traffic could affect the safety of visitors and employees using park roads, as deer/vehicle collisions have occurred in the past and could increase.

Implementation of some of the proposed actions could potentially impact public safety. The park would introduce new educational programs to inform visitors about the actions being taken and ensure visitors did not enter areas being targeted for deer trapping, darting, or lethal reduction. Deer management activities would be conducted in a manner that would minimize risk to the safety of park visitors and employees. Therefore, the impact topic of public safety is considered.

Park Operations

Valley Forge NHP staff and funding are used to promote the visitor experience and protect natural and cultural resources. Past and current monitoring of the park's

vegetation and deer population have been driven by available staff and funding. Proposals made in this plan/EIS could result in changes to staffing and funding. Therefore, the impact topic of park operations is considered.

1.7.2 Issues and Impact Topics Considered but Dismissed from Further Analysis

The following impact topics were initially considered but then dismissed from further analysis because they do not exist at Valley Forge NHP or would not be impacted by the proposed actions. They include geohazards, soils and water quality, air quality, energy resources, prime farmlands, paleontological resources, floodplains and wetlands, soundscapes, museum collections, ethnographic resources, Indian Trust resources, and environmental justice. A brief rationale for the dismissal of each impact topic is provided below.

Geohazards

There are no known geohazards within the park that have been affected by deer management activities, and the implementation of any of the proposed alternatives would not impact geohazards. Therefore, the impact topic of geohazards was dismissed from further analysis.

Soils and Water Quality

Although overbrowsing by deer can be related to increased rates of erosion and sedimentation of surrounding water resources, the impact is not at a scale great enough to be measured or evaluated in this plan. Similarly, the implementation of any of the proposed alternatives would not impact soils or water quality to a level that could be measured or evaluated. Therefore, the topic of soils and water quality was dismissed from further analysis.

Prime Farmlands

No “unnecessary and irreversible conversion of farmland to non-agricultural uses” (Farmland Protection Policy Act of 1980) is expected under this action. Thus, no impacts to prime and unique farmlands are expected. Therefore, the topic of prime farmlands was dismissed from further analysis.

Paleontological Resources

There are four known paleontological sites within the park, but they would not be affected by or interfere with deer management activities. Therefore, the topic of paleontological resources was dismissed from further analysis.

Floodplains and Wetlands

No occupancy, modification, or development of floodplains or wetlands is expected under this plan. The removal of ground vegetation through deer browsing could have the potential to increase stormwater runoff and flood events. However, it was determined that impacts related to an increase in water quantity would be negligible. Wetlands and riparian buffers are already protected from deer impacts by fencing. This plan would not propose any additional elements that could impact these resources. Any impact to riparian buffers that surround these areas will be addressed under the “Vegetation and Special Status Plant Species” section of this document. Therefore, this topic of floodplains and wetlands was dismissed from further analysis.

Air Quality

The 1963 Clean Air Act, as amended (42 USC 7401 et seq.) requires land managers to protect air quality. Section 118 of the Clean Air Act further requires parks to meet all federal, state, and local air pollution standards and NPS *Management Policies 2006* (NPS 2006c) addresses the need to analyze potential impacts to air quality during park planning. Located within Chester and Montgomery Counties, Valley Forge NHP sits within the Environmental Protection Agency's (EPA) Philadelphia-Wilmington-Trenton Severe Ozone Nonattainment Area. Actions proposed at the study area would have minimal short-term impacts to air quality. Implementing some of the deer management options could result in temporary increases in vehicle exhaust and emissions. However, hydrocarbons, nitrates, and sulfur dioxide emissions, as well as any airborne particulates created by fugitive dust plumes would be rapidly dissipated because air stagnation is rare at the park. Overall, there could be negligible impacts on local air quality; however, such impacts would be short-term, lasting only as long as proposed actions were being carried out. Therefore, the impact topic of air quality was dismissed.

Climate Change

Climate change refers to any significant changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality, storm frequency, etc.) lasting for an extended period (decades or longer). Recent reports by the U.S. Climate Change Science Program, the National Academy of Sciences, and the United Nations Intergovernmental Panel on Climate Change (IPCC) provide clear evidence that climate change is occurring and will accelerate in the coming decades. There is strong evidence that global climate change is being driven by human activities worldwide, primarily the burning of fossil fuels and tropical deforestation. These activities release carbon dioxide and other heat-trapping gases, commonly called "greenhouse gases," into the atmosphere (IPCC 2007a, 2007b, 2007c, 2007d).

There are two aspects of climate change that must be considered in an environmental impact analysis:

- our impact on climate change - i.e., through our actions, the potential to increase or decrease emissions of greenhouse gases that contribute to climate change
- the impact of climate change on us - i.e., how are the resources that we manage likely to change in response to changing climate conditions, and how does that change or otherwise affect our management actions and the impacts of those actions on the resource

Impacts of this Deer Management Plan on Climate Change

The actions proposed in any of the deer management alternatives would not result in more than a negligible increase in greenhouse gas emissions. Some of the activities in the alternatives, such as administering reproductive controls, sharpshooting, and capture, may require bringing in specialized personnel to assist park staff or perform tasks that park staff cannot; therefore, there would likely be a small increase in vehicular trips associated with travel by such specialized personnel to and from the park. Because these types of specialized tasks would occur on an annual basis for a short period of time; e.g., administering reproductive controls; or on an irregular or as-needed basis; i.e., chronic wasting disease monitoring, this additional vehicular travel is not expected to result in more than a negligible increase in the current

amount of vehicular traffic, and associated greenhouse gas emissions, in the park or the Valley Forge area. Cumulatively, Pennsylvania contributes 1% of total global emissions of carbon dioxide, and of all U.S. states it is the third-highest in emissions from fossil-fuel sources, behind Texas and California (Union of Concerned Scientists [UCS] 2008). Although there are currently no air quality standards for greenhouse gases against which to compare Pennsylvania's emissions, the fact that it ranks third-highest indicates that, cumulatively, Pennsylvania's contribution to greenhouse gas emissions on global climate change may be significant. However, the contribution of greenhouse gas emissions from any of the alternatives evaluated in this plan/EIS would add only a negligible increment to this impact. Therefore, the impact of this deer management plan on climate change was dismissed from further analysis.

Impacts of Climate Change on this Deer Management Plan

Pennsylvania's climate has already begun changing in noticeable ways (UCS 2008). Many of the specific effects, the rate of changes, and the severity of impacts are not known. However, it is reasonable to expect that, given some of the climate changes that have been documented in Pennsylvania to date, park resources are already experiencing changes and stresses associated with climate change, and that climate change can be expected to affect the park during the life of this plan and beyond. With regard to the impacts of climate change on deer management in Valley Forge NHP, the impact topics of vegetation and wildlife analyzed in this EIS may be impacted by climate change, as well as actions proposed under any of the alternatives. Therefore, climate change is incorporated into the cumulative impact analysis for the impact topics of vegetation and special status plant species, as well as other wildlife, wildlife habitat, and special status animal species in Chapter 4: Environmental Consequences.

Energy Requirements and Conservation Potential

The Council on Environmental Quality (CEQ) guidelines for implementing NEPA require examination of energy requirements and conservation potential as a possible impact topic in environmental documents. Valley Forge NHP strives to incorporate the principles of sustainable design and development into all facilities and park operations. The objectives of sustainability are to design structures to minimize adverse impacts on natural and cultural values; to reflect their environmental setting; to maintain and encourage biodiversity; to construct and retrofit facilities using energy efficient materials and building techniques; to operate and maintain facilities to promote their sustainability; and to illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use. Essentially, sustainability is living within the environment with the least impact on the environment. The action alternatives presented in this document subscribe to and support the practice of sustainable planning in part by promoting regeneration of a diverse vegetative community. The proposed action aims to develop alternatives that meet the purpose and need of the project while maintaining sustainable planning and implementation. The park would encourage suppliers and contractors to follow sustainable practices. Consequently, any adverse impacts relating to energy use, availability, or conservation would be negligible. Therefore, the impact topic of energy requirements and conservation potential is dismissed.

Soundscapes

Due to the urban setting of the park and the large amount of through-traffic, natural sounds are heavily masked by through-traffic and other extrinsic sounds. The implementation of any of the proposed alternatives may create new noise related to

vehicle or weapon use. However, these increases would not cause a noticeable change to the existing sound levels. Therefore, the impact topic of soundscapes was dismissed from further analysis.

Museum Collections

None of the proposed actions would affect museum collections. Therefore the impact topic of museum collections was dismissed from further analysis.

Ethnographic Resources

Ethnographic resources are defined as any "site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it" (Director's Order 28). No specific sites, structures, or objects at Valley Forge NHP have been identified as ethnographic resources; therefore, the impact topic of ethnographic resources was dismissed. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during the implementation of deer management activities, provisions outlined in the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) would be followed. See Chapter 5: Consultation and Coordination for a summary of the ongoing tribal coordination.

Indian Trust Resources and Sacred Sites

Secretarial Order 3175 requires that any anticipated impacts to Indian Trust resources from a proposed project or action by U.S. Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian Trust responsibility is a legally enforceable obligation on the part of the U.S. to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal laws with respect to American Indians, Alaskan Natives, and Native Hawaiians. There are no known Indian Trust resources or sacred sites at Valley Forge NHP, and the lands comprising the park are not held in trust by the secretary of the interior for the benefit of Indians due to their status as Indians. Therefore, the impact topic of Indian Trust resources and sacred sites was dismissed.

Environmental Justice

Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-income Populations" requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental impacts of their programs and policies on minorities and low-income populations and communities. No minority or low-income populations are located adjacent to the park, so the proposed management objectives and potential actions would not affect these populations, being confined to federal land and the immediately adjacent neighborhoods. Therefore, the impact topic of environmental justice was dismissed.

1.8 Related Laws, Policies, Plans, and Constraints

1.8.1 National Park Service Organic Act

By enacting the NPS Organic Act of 1916, Congress directed the U.S. Department of the Interior and the NPS to manage units of the national park system "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC § 1). The Redwood National Park Expansion Act of 1978 reiterates this mandate by stating that NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC § 1a-1).

Despite these mandates, the Organic Act and its amendments afford the NPS latitude when making resource decisions. By these acts, Congress "empowered [the NPS] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use" (Bicycle Trails Council of Marin v. Babbitt, 82 F.3d 1445, 1453 [9th Cir. 1996]).

The Organic Act of 1916 directs the NPS "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Yet, courts have consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor recreation. In Michigan, *United Conservation Clubs v. Lujan* (949 F.2d 202, 206 (6th Cir. 1991)) the court stated, "Congress placed specific emphasis on conservation." In *National Rifle Ass'n of America v. Potter* (628 F.Supp. 903, 909 [D.D.C. 1986]) the court stated, "In the Organic Act, Congress speaks of but a single purpose, namely, conservation." The NPS *Management Policies 2006* (NPS 2006c) also recognize that resource conservation takes precedence over visitor recreation. The policy dictates, "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant."

The Organic Act instructs the NPS that it is not allowed to impair its own resources. This is one of the factors involved in analyzing impacts of the proposed alternatives. For a more thorough discussion of this topic, see Chapter 4: Environmental Consequences.

1.8.2 NPS Management Policies 2006

Several sections from the NPS *Management Policies 2006* (NPS 2006c) are relevant to deer management in Valley Forge NHP, as described below. *Management Policies 2006* instructs park units to maintain as parts of the natural ecosystems of parks all native plants and animals. The NPS will achieve this maintenance by "preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur."

Furthermore, the NPS "will adopt park resource preservation, development, and use management strategies that are intended to maintain the natural population fluctuations and processes that influence the dynamics of individual plant and animal populations, groups of plant and animal populations, and migratory animal populations in parks." Whenever the NPS identifies a possible need for reducing the

size of a park plant or animal population, the decision will be based on scientifically valid resource information that has been obtained through consultation with technical experts, literature review, inventory, monitoring, or research (NPS 2006c).

Section 4.4.2 of the *Management Policies* also states, "Whenever possible, natural processes will be relied upon to maintain native plant and animal species, and to influence natural fluctuations in populations of these species. The Service may intervene to manage individuals or populations of native species . . . when at least one of the following conditions exists:

- Management is necessary
  - because a population occurs in unnaturally high or low concentration as a result of human influences (such as loss of seasonal habitat, the extirpation of predators, the creation of highly productive habitat through agriculture or urban landscapes) and it is not possible to mitigate the effects of the human influences;
  - to protect specific cultural resources of parks; . . .
  - to protect rare, threatened, or endangered species."

Section 4.4.2.1 of the 2006 *NPS Management Policies* allows for the management of native species to prevent them from interfering broadly with natural habitats, natural abundances, and natural distributions of native species and natural processes. Section 4.4.2.1 of the *NPS Management Policies* states, "Where visitor use or human activities cannot be modified or curtailed, the Service may directly reduce the animal population by using several animal population management techniques, either separately or together. These techniques include relocation, public hunting on lands outside the park, habitat management, predator restoration, reproductive intervention, and destruction of animals by NPS personnel or their authorized agents. Where animal populations are reduced, destroyed animals may be left in natural areas of the park to decompose" (NPS 2006c). Additionally, the Secretary has broad discretion in managing wildlife. Section 4.4.2.1 of the *NPS Management Policies* also states that the destruction of animals may be carried out by NPS personnel or their authorized agents.

1.8.3 Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-Making

NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-Making,* and its accompanying handbook (NPS 2001) lay the groundwork for how the NPS complies with NEPA, and its implementing regulations (40 CFR 1500-1508). Director's Order 12 and the handbook set forth a planning process for incorporating scientific and technical information and for establishing an administrative record for NPS projects.

Director's Order 12 requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists. Director's Order 12 also requires that an analysis of impairment to park resources and values be made as part of the NEPA document.

1.8.4 Natural Resource Reference Manual 77

The Natural Resource Reference Manual 77, which supersedes the 1991 NPS 77: *Natural Resource Management Guideline*, provides guidance for NPS employees responsible for managing, conserving, and protecting the natural resources found in national park system units (NPS 2004b).

1.8.5 Other Federal Legislation, Compliance, and NPS Policy

In addition to the NPS Organic Act, the NPS is governed by other laws and regulations. Based on the scope of this plan, these include the following.

National Environmental Policy Act (NEPA) of 1969, as Amended

Section 102(2) (c) of this act requires that an EIS be prepared for proposed federal actions that may significantly affect the quality of the human environment or are major or controversial federal actions.

National Parks Omnibus Management Act of 1998 (NPOMA)

NPOMA (16 USC 5901 et seq.) underscores NEPA in that both are fundamental to NPS park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available and provide options for resource impact analysis should this be the case.

NPOMA directs the NPS to obtain scientific and technical information for analysis. The NPS handbook for Director's Order 12 states that if, "such information cannot be obtained due to excessive cost or technical impossibility, the proposed alternative for decision will be modified to eliminate the action causing the unknown or uncertain impact or other alternatives will be selected" (section 4.4).

Redwood National Park Act of 1978, as Amended

All NPS units are to be managed and protected as parks, whether established as a recreation area, historic site, or any other designation. This act states that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

Code of Federal Regulations, Title 36 and Title 43

Title 36, Chapter 1 of the Code of Federal Regulations (CFR) provides the regulations "for the proper use, management, government, and protection of persons, property, and natural and cultural resources within areas under the jurisdiction of the NPS." It states that "the National Park Service has the authority to manage the wildlife in the parks in fulfillment of the Organic Act without the consent of the state and by methods contrary to state law" (16 USC 3).

In section 2.1, the code prohibits the introduction of wildlife into a park ecosystem. Section 2.2 prohibits the taking of wildlife, except by authorized activities; feeding, touching or harassing of wildlife; as well as limiting where and when hunting may occur. These sections of the code must be considered in determining appropriate management of the deer population at Valley Forge NHP.

In 43 CFR Part 24, the U.S. Department of the Interior is provided with specific guidance for interagency cooperation, preservation, management, and use of fish and wildlife resources. The section specifically notes that each unit of the NPS is guided by its own enabling legislation which dictates if hunting, fishing, or trapping is allowed within the park. If the enabling legislation does not specifically allow for these activities, they are prohibited on NPS lands.

Endangered Species Act of 1973, as Amended

This act requires all federal agencies to consult with the secretary of the interior on all projects and proposals having potential effects on federally endangered and threatened plants and animals. Under Section 7 of this act, the NPS is required to coordinate with the U.S. Fish and Wildlife Service (USFWS) to ensure that any of its actions do not impact federally listed species. When such species may be impacted by a proposed project, additional coordination is required to develop a biological opinion on the impact to the given species.

National Historic Preservation Act of 1966, as Amended

Section 106 of this act requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the National Register of Historic Places. All actions affecting the park's cultural resources must comply with this legislation.

Historic Sites Act of 1935

This act declares the preservation of historic sites, buildings, objects, and properties of national significance for public use as national policy. It authorizes the secretary of the interior and NPS to restore, reconstruct, rehabilitate, preserve, and maintain historic or prehistoric sites, buildings, objects, and properties of national historical or archeological significance.

Federal Noxious Weed Act of 1974

The Federal Noxious Weed Act provides for the control and management of nonindigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or public health.

Executive Order 13112 – Invasive Species

This executive order requires the NPS to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species can cause.

Executive Order 11593 – Protection and Enhancement of the Cultural Environment

This executive order directs the NPS to support the preservation of cultural properties and to identify and nominate to the National Register cultural properties within the park and to "exercise caution . . . to assure that any NPS-owned property that might qualify for nomination is not inadvertently transferred, sold, demolished, or substantially altered."

Executive Order 13186 – Protection of Migratory Birds

This executive order was put in place to implement the Migratory Bird Treaty Act of 1918, which affirms agreements made at four international conventions to protect migratory birds. This executive order directs the NPS to avoid actions that have a measurable adverse impact on migratory bird populations, and to promote the conservation of migratory bird populations.

Director's CWD Guidance Memorandum

To address concerns related to CWD, the director of the NPS released a memorandum (NPS 2002b) with the following guidance:

- NPS units should cooperate and coordinate with state agencies regarding CWD response.
- NPS units within 60 miles of where CWD has been detected should initiate targeted and opportunistic surveillance by removing deer with clinical signs of CWD, as well as submitting samples from all deer found dead.
- All translocations of deer in or out of NPS units would be prohibited without extensive CWD surveillance.
- Public outreach should be conducted.
- NEPA should be used as a decision-making tool if other actions for CWD detection or response are being considered.

1.8.6 Related State Laws, Regulations, and Policies

Pennsylvania Code, Title 58: Game Commission

Title 58, Part III of the Pennsylvania Code authorizes the PGC as the agency responsible for management of wildlife species in the commonwealth. This legislation describes wildlife classification, lands and buildings, seasons and bag limits, hunting and trapping, licensing, hearing procedures, and special permits. Regulations related to the Political Subdivision deer control permits and Deer Management Assistance Program harvest permits are found in section 147.3 and 147.6, respectively.

Pennsylvania Code, Title 34: Game and Wildlife Code

Title 34 of the Pennsylvania Code addresses wildlife management through the Pennsylvania Game Commission. This legislation prescribes means for establishing public hunting seasons, hunting permit requirements, allowable takes, tagging requirements, and permissible equipment.

Section 141.2 of the Pennsylvania Code outlines the circumstances that may occur to allow the protection of wildlife to be removed. These circumstances include damage to personal property and disease. This section also directs the taking to be carried out in a humane and lawful manner.

Amendments to Title 34 establish special regulations for particular areas of the state. Special Regulations Areas within Pennsylvania are Allegheny County in western Pennsylvania and the Greater Philadelphia Area in southeastern Pennsylvania (all of Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties). Special

regulations in southeastern Pennsylvania relate to season and antler restrictions, arms and ammunition, and safety zones.

Pennsylvania Chronic Wasting Disease Response Plan

Although CWD does not yet occur within Pennsylvania, there is a high risk of disease introduction. In 2007, the Commonwealth of Pennsylvania released a response plan for CWD (PDWCTF 2007, 2008). This plan was developed by an interagency CWD task force responsible for developing a strategic program for the prevention, early detection, and eradication of CWD in free-ranging and farmed cervids[5]. The prevention phase of response includes establishment of a communication strategy, outreach to taxidermists, deer processors, sportsmen groups, landfill operators, etc., and establishment of requirements or regulations related to the farmed cervid industry, importation of live cervids, and supplemental feeding of free ranging deer and elk (PCWDTF 2007).

The preparation/early detection phase of response includes updating the response plan, acquiring necessary materials, developing testing and disposal capabilities, training personnel, and establishment of a surveillance program. Surveillance of free-ranging deer currently falls into two categories: targeted and active lethal surveillance. Targeted surveillance requires testing of deer with signs consistent with CWD. As of June 2007, over 500 abnormal deer and elk have been tested by the PGC. Active lethal surveillance requires testing of representative samples of apparently healthy cervids acquired through normal hunting seasons, under crop damage permits, or as a result of deer-vehicle collisions. As of June 2007, 14,269 deer and 222 elk have been tested by the PGC. No cervids tested positive for CWD (PCWDTF 2007).

The response plan is based on increasing levels of readiness. Level 2 readiness is achieved when an animal within 50 miles of Pennsylvania tests positive or testing for a Pennsylvania animal is inconclusive and awaits confirmation. Level 1, the highest level of readiness, occurs when an animal within Pennsylvania tests positive for CWD. At this point, the PGC and the Pennsylvania Department of Agriculture initiate a process to determine the percent of animals infected and to fully contain and eradicate the disease (PCWDTF 2007). The recommended disposal method for infected animals is landfilling in a site which meets modern sanitary landfill standards such as engineered liners, caps, and leachate and gas collection systems (PCWDTF 2007). According to the Pennsylvania CWD response plan (PCWDTF 2007), a 5-mile radius surveillance area (79 square miles) will be established by the state around the first positive case of CWD, and intensive CWD testing will be conducted to confirm presence of the disease. If additional positive cases are detected, a containment zone will be established by the state, adding a buffer area around the 5-mile radius surveillance area. The buffer area will have a radius at least as large as the surveillance area radius (PCWDTF 2007).

1.8.7 Relationship to Other Planning Documents for Valley Forge NHP

The purpose, need, and objectives for the white-tailed deer management plan/EIS must be, to a large degree, consistent with park planning documents. These documents include the 1999 *Resources Management Plan*, the 2005 *Strategic Plan*,

[5] A horned member of the deer family.

the 2001 *Cultural Landscape Inventory*, the 2002 *Contextual Documentation and Cultural Landscape Plan (Volumes I and II)*, and the 2007 *Final General Management Plan/Environmental Impact Statement and Record of Decision*.

Valley Forge NHP Final General Management Plan/Environmental Impact Statement and Record of Decision (2007)

A new GMP/EIS was developed to replace the previous plan, completed in 1982. The new plan establishes management objectives for Valley Forge NHP in terms of resource management, visitor use and experience, and park operations. Natural resources are addressed in this new GMP to allow for resource protection and management. With respect to natural resources within the park, the new GMP provides the following primary objective:

> *Biological resources are managed to preserve and restore natural abundances, diversities, dynamics, and distributions of native plants and animal populations within forested and other naturally occurring communities. In naturally occurring communities where species populations occur in unnaturally high or low concentrations as a result of human influences or extirpation of predators, and such occurrences cause unacceptable impacts on natural resources and natural processes, biological and physical remedial actions would accelerate natural recovery.*

The GMP further emphasized the need for development and implementation of a deer management plan to meet the natural resource objective.

Strategic Plan for Valley Forge NHP 2005-2008 (2005)

The strategic plan reviews the current state of the park and sets goals for park management. These goals are based on time constraints and financial factors. The most recent plan recognizes that deer management has become a problematic and controversial issue for the park. The plan endorses a more active management strategy towards all natural resources, including deer and invasive, nonnative plants, for the betterment of the overall environment.

Contextual Documentation and Cultural Landscape Plan Volumes I and II (2002)

These documents combine both historic resources studies and cultural landscape reports and include both contextual research and cultural landscape documentation for the park. These volumes categorize the study area as nationally significant for its association with the encampment of the Continental Army, commemoration, park development, and the Village of Valley Forge development. The cultural landscape inventory and plan do not establish specific landscape treatments, but rather provide general information on the cultural landscapes that exist at Valley Forge NHP. This information can be used to achieve cultural resource objectives of protecting the integrity of cultural landscape, including the patterns of open versus wooded land, commemorative plantings, and vegetative screenings.

Cultural Landscape Inventory (2001)

This report documents all cultural and natural features that contribute to the National Register significance of the park. Four component landscapes were documented in more detail: the Port Kennedy area; the Valley Forge farm cluster (Philander C. Knox

estate, Lafayette's Quarters, and Stirling's Quarters); the Village of Valley Forge; and Walnut Hill. The cultural landscape inventory identifies the historic uses of the land and notes areas that have been adversely impacted and no longer match the historic character of the park. Some of these impacts can be directly attributed to deer browse.

Valley Forge NHP Resources Management Plan (1999)

The resource management plan tiered from the 1982 GMP by providing details on resource management strategies for the management of Valley Forge NHP. The report outlined the condition of park resources, problems or threats to the condition of the resources, and management strategies for improving adverse conditions. The report called for additional monitoring and research on the white-tailed deer population, including deer exclosures, and annual spotlight counts.